S Army Corps

Louisville District

Solicitation for

Fire Training Facility

Westover Air Reserve Base, MA

27 May 1998

SFB DACA27-98-B-0022

BOND REQUIRED
WITH BID

THIS PROCUREMENT
HAS NO BUSINESS
SIZE RESTRICTIONS

USACE CONSTRUCTION CONTRACT FORMAT

DIVISION	SECTION	TITLE
	00010	**Solicitation/Contract Form (1442)** **Bid Schedule**
00100		**Instruction to Bidders/Offerors**
	00105	**Instructions for Sealed Bid Contracts**
00600		**Representations and Certifications**
	00605	**Representations, Certifications, and Other Statements of Bidders (Sealed Bid)**
00700		**Contract Clauses**
00800		**Special Contract Requirements**
01000		**Division 1, General Requirements**
02000 thru 16999		**Division 2-16, Technical Provisions**

OMB APPROVAL NO. 2700-0042

SOLICITATION, OFFER, AND AWARD (Construction, Alteration, or Repair)	1. SOLICITATION NO.	2. TYPE OF SOLICITATION	3. DATE ISSUED	PAGE OF PAGES
	DACA27-98-B-0022	[X] SEALED BID (IFB) [ ] NEGOTIATED	27 May 1998	1 of 5

IMPORTANT - The "offer" section on the reverse must be fully completed by offeror.

4. CONTRACT NO.	5. REQUISITION/PURCHASE REQUEST NO.	6. PROJECT NO.
	W22W9K-81037882	

7. ISSUED BY CODE	8. ADDRESS OFFER TO
U.S. Army Engineer District, Louisville Corps of Engineers 600 Dr. Martin Luther King, Jr. Place Louisville, Kentucky 40202-2230	U.S. Army Engineer District, Louisville Corps of Engineers 600 Dr. Martin Luther King, Jr. Place Louisville, Kentucky 40202-2230

9. FOR INFORMATION CALL:	A. NAME	B. TELEPHONE NO. *(Include area code)* ***(NO COLLECT CALLS)***
	See Instructions	See Instruction

SOLICITATION

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder."

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS *(Title, identifying no., date):*

FIRE TRAINING FACILITY, WESTOVER AIR RESERVE BASE, MA

Construct a fire training facility to comply with the Air Force standard requirements. The facility contains burn area with HPDE liner, LPG storage distribution system, safety control tower, water conservation pond, airframe system, fire hydrant/valve pit, compacted aggregate surfacing, security fencing, and mechanical and electrical items to provide a functional facility. Option for smokehouse.

The estimated cost range of this project is from $1,000,000 to $5,000,000.

BID MODIFICATIONS RECEIVED BY FACSIMILE OR TELETYPE WILL NOT BE CONSIDERED.

AWARD IS BEING MADE PURSUANT TO THE SMALL BUSINESS COMPETITIVENESS DEMONSTRATION PROGRAM. (THIS PROCUREMENT HAS NO BUSINESS SIZE RESTRICTIONS.)

DEFENSE PRIORITY AND ALLOCATION REQUIREMENTS (SEP 1990) FAR 52.211-14: This is a rated order certified for national defense use, and the Contractor shall follow all the requirements of the Defense Priorities and Allocations System regulation (15 CFR 700), PRIORITY RATING: DO-C2

11. The Contractor shall begin performance within _10_ calendar days and complete it within _**_ calendar days after receiving [ ] award, [X] notice to proceed. This performance period is [X] mandatory, [ ] negotiable. *(See **Section 00800, Para 1.)*

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS?	12B. CALENDAR DAYS
[x] YES [ ] NO	10

13. ADDITIONAL SOLICITATION REQUIREMENTS:

A. Sealed offers in original and _2__ copies to perform the work required are due at the place specified in Item 8 by **2:00 p.m.** *(hour)* local time **26 June 1998** *(date)*. If this is a sealed bid solicitation, offers must be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

B. An offer guarantee [X] is, [ ] is not required.

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

D. Offers providing less than __60___ calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.

OFFER *(Must be fully completed by offeror)*

14. NAME AND ADDRESS OF OFFEROR *(Include ZIP Code)*	15. TELEPHONE NO. *(Include area code)*
DUNS #	16. REMITTANCE ADDRESS *(Include only if different than Item 14)* TIN #
CODE FACILITY CODE	

17. The offeror agrees to perform the work at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by th Government within __60___ calendar days after the date offers are due. *(Insert any number equal to or greater than the minimum requirement state 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.*

AMOUNTS —	Bidders shall show his prices on the Bid Schedule of this section.

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGMENT OF AMENDMENTS

The offeror acknowledges receipt of amendments to the solicitation -- give number and date of each

AMENDMENT NO.										
DATE										

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER *(Type or print)*	20B. SIGNATURE	20C. OFFER DATE

AWARD *(To be completed by Government)*

21. ITEMS ACCEPTED:

22. AMOUNT	23. ACCOUNTING AND APPROPRIATION DATA	
24. SUBMIT INVOICES TO ADDRESS SHOWN IN *(4 copies unless otherwise specified) Will be identified in Delegation letters.*	ITEM:	25. OTHER THAN FULL AND OPEN COMPETITION URSUANT TO ☐ 10 U.S.C. 2304(c)( ) ☐ 41 U.S.C. 253(c)( )
26. ADMINISTERED BY CODE U.S. Army Engineer District, Louisville Corps of Engineers, P.O. Box 59 Louisville, KY 40201-0059		27. PAYMENT WILL BE MADE BY USACE Finance Ctr. (UFC) 7800 Third Avenue Millington, TN 38054-5005

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28. NEGOTIATED AGREEMENT *(Contractor is required to sign this document and return ____ copies to issuing office.)* Contractor agrees to furnish and deliver all items or perform all work, requisitions identified on this form and any continuation sheets for the consideration slated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications or incorporated by reference in or attached to this contract.		☐ 29. AWARD *(Contractor is not required to sign this document.)* Y on this solicitation is hereby accepted as to the items listed. Th consummates the contract, which consists of (a) the Government s and your offer, and (b) this contract award. No further contractual doc necessary.	
30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN *(Type or print)*		31A. NAME OF CONTRACTING OFFICER *(Type or print)*	
30B. SIGNATURE	30C. DATE	31B. UNITED STATES OF AMERICA BY	31C. AWARD DATE

ALL BIDDERS READ THE FOLLOWING INSTRUCTIONS

1. Each bidder shall, upon request of the Contracting Officer, furnish a list of the plant available to the bidder and proposed for use of the work.

2. Bidders are cautioned that drawings may not be reproduced to exact scale. All drawings, whether full size or reduced, should be checked for potential discrepancies, dimensions and scales should be verified and all drawings compared.

3. Bidders are required to acknowledge receipt of all amendments to this solicitation on Standard Form 1442 in the space provided, by completing Blocks 8 and 15 of the Amendment Form (SF 30), by separate letter, or by telegram prior to opening of bids. Failure to acknowledge all amendments may cause rejection of the bid/proposal.

NOTE: The Louisville District Office does not have it's own teletype. The bidder must insure that acknowledgment of any of any amendments by telegram will be physically delivered (telephone delivery is not acceptable) and received by the Government prior to the time set for opening of bids.

NEITHER FACSIMILE NOR TELEGRAPHIC BIDS ARE AUTHORIZED!!

CAUTION TO BIDDERS

BEFORE SIGNING AND MAILING THIS BID, PLEASE TAKE NOTE OF THE FOLLOWING, AS FAILURE TO PERFORM ANY ONE OF THESE ACTIONS MAY CAUSE YOUR BID TO BE REJECTED.

1. **AMENDMENTS**. Have you acknowledge receipt of ALL amendments? If in doubt as to the number of amendments issued, please contact our office.

2. **AMENDED BID PAGES**. If any of the amendments furnished amended bid pages, the amended bid pages must be used on submitting your bid.

3. **LATE BIDS**. Please refer to the Instructions section contained in this package.

4. **BID GUARANTEE**. If bid guarantee is required for this project, sufficient bid guarantee in proper form must be furnished with your bid for construction projects exceeding $100,000.

5. **MISTAKE BID**. Have you reviewed your bid prices for possible errors in calculations or work left out?

6. **FAX MODIFICATIONS OF BIDS**. We do not permit modifications of bids by fax.

BID SCHEDULE

CONTINUATION SHEET	REFERENCE NO. DOCUMENT BEING CONTINUED	PAGE
	DACA27-98-B-0022	5 of 5

NAME OF OFFEROR OR CONTRACTOR

ITEM NO.	SUPPLIES/SERVICES	QTY	UNIT	UNIT PRICE	AMOUNT
	FIRE TRAINING FACILTIY **WESTOVER AIR RESERVE BASE, MA**				
1A	Fire Training Facility excluding the following options	1	LS		$_____
1B	Complete Air Frame Mock-Up	1	LS		$_____
	TOTAL BASE BID				$_____
	OPTIONS				
O1	Smokehouse and associated work	1	LS		$_____
	TOTAL OPTIONS + BASE BID				$_____
	Prices for the options shall be good for 60 days after award of the contract. The project duration shown in Section 00800, para. 1 will not be affected by the exercising of the options.				

SECTION 00105

INSTRUCTIONS FOR SEALED BID CONTRACTS

2 Jan 96
1. SOLICITATION DEFINITIONS - SEALED BIDDING - (July 1987) FAR 52.214-1.

"Government" means United States Government. "Offer" means "bid" in sealed bidding. "Solicitation" means an invitation for bids in sealed bidding.

2. AMENDMENTS TO INVITATIONS FOR BIDS (DEC 1989) FAR 52.214-3.

(a) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.

(b) Bidders shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by identifying the amendment number and date in the space provided for this purpose on the form for submitting a bid, 3) by letter or telegram, or (4) by facsimile, if facsimile bids are authorized in the solicitation. The Government must receive the acknowledgment by the time and at the place specified for receipt of bids.

3. FALSE STATEMENTS IN BIDS (APR 1984) FAR 52.214-4.

Bidders must provide full, accurate, and complete information as required by this solicitation and its attachments. The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

20 March 1997
4. SUBMISSION OF BIDS (FEB 1997) FAR 52.214-5 (Para. a-e only).

(a) Bids and bid modifications shall be submitted in sealed envelopes or packages, (unless submitted by electronic means).

(1) Addressed to: U.S. Army Engineer District, Louisville
600 Dr. Martin Luther King, Jr. Place
Room 821
Louisville, Kentucky 40202-2230

(2) Showing the time specified for receipt, the solicitation number, and the name and address of the bidder.

(b) Bidders using commercial carrier services shall ensure that the bid is addressed and marked on the outermost envelope or wrapper as prescribed in subparagraphs (a)(1) and (2) of this provision when delivered to the office specified in the solicitation.

(c) Telegraphic bids will not be considered unless authorized by the solicitation; however, bids may be modified or withdrawn by written or telegraphic notice.

(d) Facsimile bids, modifications, or withdrawals will not be considered unless authorized by the solicitation.

(e) Bids submitted by electronic commerce shall be considered only if the electronic commerce method was specifically stipulated or permitted by the solicitation.

(f) Hand-carried bids shall be deposited in the depository located in Room 821, Federal Building, 600 Dr. Martin Luther King, Jr. Place, Louisville, Kentucky.

(g) Express mail bids shall be addressed as shown in Paragraph (a) (1) above, ATTN: CEORLCT/Hitner.

5. EXPLANATION TO PROSPECTIVE BIDDERS (APR 1984) FAR 52.214-6.

Any prospective bidder desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must request it in writing soon enough to allow a reply to reach all prospective bidders before the submission of their bids. Oral explanations or instructions given before the award of a contract will not be binding. Any information given a prospective bidder concerning a solicitation will be furnished promptly to all other prospective bidders as an amendment to the solicitation, if that information is necessary in submitting bids or if the lack of it would be prejudicial to other prospective bidders.

20 March 1997
6. LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS OF BIDS (MAY 1997) FAR 52.214-7.

(a) Any bid received at the office designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and it--

(1) Was sent by registered or certified mail not later than the fifth calendar day before the date specified for the receipt of bids (e.g., a bid submitted in response to a solicitation requiring receipt of bids by the 20th of the month must have been mailed by the 15th); or

(2) Was sent by mail (or telegram or facsimile, if authorized) or hand-carried (including delivery by a commercial carrier) if it is determined by the Government that the late receipt was due primarily to Government mishandling after receipt at the Government installation;

(3) Was sent by U.S. Postal Service Express Mail Next Day Service-Post Office to Addressee, not later than 5:00 P.M. at the place of mailing two working days prior to the date specified for receipt of bids. The term "working days" excludes weekends and U.S. Federal holidays; or

(4) Was transmitted through an electronic commerce method authorized by the solicitation and was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of bids.

(b) Any modification or withdrawal of a bid is subject to the same conditions as in paragraph (a) of this provision.

(c) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark both on the envelope or wrapper and on the original receipt from the U.S. or Canadian Postal Service. Both postmarks must show a legible date or the bid, modification, or withdrawal shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, bidders should request the postal clerk to place a legible hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(d) The only acceptable evidence to establish the time of receipt at the Government installation is the time/date stamp of that installation on the bid wrapper or other documentary evidence of receipt maintained by the installation.

(e) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent by U.S. Postal Service Express Mail Next

Day Service-Post Office to Addressee is the date entered by the post office receiving clerk on the "Express Mail Next Day Service-Post Office to Addressee" label and the postmark on the envelope or wrapper and on the original receipt from the U.S. Postal Service. "Postmark" has the same meaning as defined in paragraph (c) of this provision, excluding postmarks of the Canadian Postal Service. Therefore, bidders should request the postal clerk to place a legible hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(f) Notwithstanding paragraph (a) of this provision, a late modification of an otherwise successful bid that makes its terms more favorable to the Government will be considered at any time it is received and may be accepted.

(g) Bids may be withdrawn by written notice or telegram (including mailgram) received at any time before the exact time set for receipt of bids. If the solicitation authorizes facsimile bids, bids may be withdrawn via facsimile received at any time before the exact time set for receipt of bids subject to the conditions specified in the provision entitled “Facsimile Bids.” A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for receipt of bids, the identify of the person requesting withdrawal is established and the person signs a receipt for the bid.

(h) If an emergency or unanticipated event interrupts normal Government processes so as to cause postponement of the scheduled bid opening, and urgent Government requirements preclude amendment of the solicitation or other notice of an extension of the opening date, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

7. PREPARATION OF BIDS - CONSTRUCTION (APR 1984) FAR 52.214-18.

(a) Bids must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a bid must initial each erasure or change appearing on any bid form.

(b) The bid form may require bidders to submit prices for one or more items on various bases, including -

(1) Lump sum bidding;
(2) Alternate prices;
(3) Units of construction; or
(4) Any combination of subparagraphs (1) through (3) above.

(c) If the solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "no bid" in the space provided for any item on which no price is submitted.

(d) Alternate bids will not be considered unless this solicitation authorizes their submission.

1 Aug 96
8. SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE (APR 1991) FAR 52.214-34

Offers submitted in response to this solicitation shall be in the English language. Offers received in other than English shall be rejected.

1 Aug 96
9. SUBMISSION OF OFFERS IN U.S. CURRENCY (APR 1991) FAR 52.214-35

Offers submitted in response to this solicitation shall be in terms of U.S. dollars. Offers received in other than U.S. dollars shall be rejected.

10. BIDDER'S QUALIFICATIONS.

Before a bid is considered for award, the bidder may be requested by the Government to submit a statement regarding his previous experience in performing comparable work, his business and technical organization, financial resources, and plant available to be used in performing the work. The successful bidders will be required to submit his Workman's Compensation Experience Modification Rate (EMR) for the previous 3 years.

11. NOT USED.

28 March 1998
12. BID GUARANTEE (SEP 1996) FARS 52.228-1 (Para. (a) - (e) only).

(a) Failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

(b) The bidder shall furnish a bid guarantee in the form of a firm commitment, such as a bid bond supported by good and sufficient surety or sureties acceptable to the Government, postal money order, certified check, cashier's check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds, (1) to unsuccessful bidders as soon as practicable after the opening of bids, and (2) to the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.

(c) The amount of the bid guarantee shall be 20 percent of the bid price or $3,000,000, whichever is less.

(d) If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or furnish executed bond(s) within 10 days after receipt of the forms by the bidder, the Contracting Officer may terminate the contract for default.

(e) In the event the contract is terminated for default, the Bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

(f) The Bid Bond penalty may be expressed in terms of a percentage of the bid price or may be expressed in dollars and cents. Bid bonds are not required for projects under $100,000.

(g) Individual Sureties. See Paragraph 15.

20 March 1997
13. PERFORMANCE AND PAYMENT BONDS. After the prescribed forms are presented to the bidder to whom award is made for signature, a written contract on the form prescribed by the specifications shall be executed and two bonds, each with good and sufficient surety or sureties acceptable to the Government shall be furnished: a Performance Bond (Standard Form 25) and a Payment Bond (Standard Form 25A). The penal sums of such bonds will be as follows:

(a) Performance Bond. The penal sum of the performance bond shall equal one hundred percent (100%) of the contract price.

(b) Payment Bond

(1) When the contract price is $1,000,000 or less, the penal sum will be fifty percent (50%) of the contract price.

(2) When the contract price is in excess of $1,000,000 but not more than $5,000,000, the penal sum shall be forty percent (40%) of the contract price.

(3) When the contract price is more than $5,000,000 the penal sum shall be $2,500,000.

(c) For rules covering the use of individual sureties see Paragraph 15. Any bonds furnished will be furnished by the Contractor to the Government prior to commencement of contract performance.

14. NOT USED.

15. RULES FOR USE OF INDIVIDUAL SURETIES.

(a) One individual surety is adequate support for a bond, provided the unencumbered value of the assets pledged by that individual surety equal or exceed the amount of the bond. An offeror may submit up to three individual sureties for each bond, in which case the pledged assets when combined must equal or exceed the penal amount of the bond. Each individual surety must accept both joint and several liability to the extent of the penal amount of the bond.

(b) An individual surety may be accepted only if a security interest in acceptable assets is provided to the Government by the individual surety. The security interest shall be furnished with the bond, and may be provided by one or a combination of the following methods:

(1) An escrow account with a federally insured financial institution in the name of the contracting agency.

(2) A lien on real property, subject to restrictions contained herein.

(c) Acceptable assets include:

(1) Cash or certificates of deposit, or other cash equivalents with a federally insured financial institution;

(2) United States Government securities at market value;

(3) Stocks and bonds actively traded on a national U.S. security exchange with certificates issued in the name of the individual surety (these assets will be accepted at 90 percent of their 52 week low, as reflected at the time of submission of the bond);

(4) Real property owned in fee simple by the surety without any form of concurrent ownership (these assets will be accepted at 100 percent of the most current tax assessment value exclusive of encumbrances or 75 percent of the properties' unencumbered market value provided a current appraisal is furnished);

(5) Irrevocable letters of credit (ILC) issued by a federally insured financial institution in the name of the contracting agency and which identify the agency and solicitation or contract number for which the ILC is provided.

(d) Unacceptable assets include but are not limited to:

(1) Notes or accounts receivable;

(2) Foreign securities;

(3) Real property as follows:

a. Real property located outside the United States, its

territories, or possessions.

b. Real property which is a principal residence of the surety.

c. Real property owned concurrently regardless of the form of co-tenancy except where all co-tenants agree to act jointly.

d. Life estates, leasehold estates, or future interests in real property.

(4) Personal property such as jewelry, furs, antiques;

(5) Stocks and bonds of the individual surety in a controlled, affiliated, or closely held concern of the Offeror/Contractor;

(6) Corporate assets (e.g., plant and equipment);

(7) Speculative assets (e.g., mineral rights);

(8) Letters of credit, except as provided in subparagraph c(5) above.

(e) With respect to the acceptance of real property, the individual surety shall provide:

(1) Evidence of title in the form of a certificate of title prepared by a title insurance company approved by the United States Department of Justice;

(2) Evidence of the amount due under any encumbrance shown in the evidence of title;

(3) A copy of the current real estate tax assessment of the property or a current appraisal dated no earlier than 6 months prior to the date of the bond, prepared by a professional appraiser who certifies that the appraisal has been conducted in accordance with the generally accepted appraisal standards as reflected in the Uniform Standards of Professional Appraisal Practice.

(4) Failure to provide evidence that the lien has been properly recorded will render the offeror nonresponsible.

(f) An individual may be excluded from acting as individual surety on bonds for any of the following causes:

(1) Failure to fulfill the obligations under any bond.

(2) Failure to disclose all bond obligations.

(3) Misrepresentation of the value of available assets or outstanding liabilities.

(4) Any false or misleading statement, signature or representation on a bond or affidavit of individual suretyship.

(5) Any other cause affecting responsibility as a surety of such serious and compelling nature as may be determined to warrant exclusion.

An individual surety excluded pursuant to this subsection shall be included on the list entitled "Parties Excluded from Procurement Programs."

(g) Any bidder or offeror should carefully review these requirements which are set forth in Section 28 of the Federal Acquisition Regulations

(FAR).

20 March 1997
16. SITE VISIT FAR (APR 1984) 52.237-1.

Offerors or quoters are urged and expected to inspect the site where services are to be performed and to satisfy themselves regarding all general and local conditions that may affect the cost of contract performance, to the extent that the information is reasonably obtainable. In no event shall failure to inspect the site constitute grounds for a claim after contract award. Site visits may be arranged during normal duty hours by contacting:

New York District
Ray Prisk
978-796-2615 □□□□

Standardization Documents
Order Desk, Building 4, Section D
700 Robbins Avenue
Philadelphia, PA 19111-5094
Fax Number 215-697-2978
Telephone Order Entry System
(TOES) Numbers 215-697-1187
through and including 215-697-1197

(b) Commercial Specifications, Standards and Descriptions. These specifications, standards and description are not available from Government sources. They may be obtained from the publishers.

20 March 1997
21. AVAILABILITY OF SPECIFICATIONS AND STANDARDS NOT LISTED IN DODISS, DATA ITEM DESCRIPTIONS NOT LISTED IN DOD 5010.12-L, AND PLANS, DRAWINGS, AND OTHER PERTINENT DOCUMENTS (DEC 1991) DFARS 252.211-7001

Offerors may obtain the specifications, standards, plans, drawings, data item descriptions, and other pertinent documents cited in this solicitation by submitting a request to:

As state in Paragraph 19.

Include the number of the solicitation and the title and number of the specification, standard, plan, drawings, or other pertinent document.

22. NOT USED.

2 Jan 96
23. INDUSTRY SMALL BUSINESS SIZE STANDARDS (NOV 1988) FAR 19.102.

23.1 General.

(a) The SBA establishes small business size standards on an industry-by-industry basis. These size standards are also set forth in SBA's regulations at 13 CFR 121.

(b) Small business size standards are applied by--

(1) Classifying the product or service being acquired in the industry whose definition, as found in the Standard Industrial Classification (SIC) Manual, best describes the principal nature of the product or service being acquired.

(2) Identifying the size standard SBA established for that industry; and

(3) Specifying the size standard in the solicitation, so that offerors can appropriately represent themselves as small or large.

(c) For size standard purposes, a product or service shall be classified in only one industry, whose definition best describes the principal nature of the product or service being acquired even though for other purposes it could be classified in more than one.

(d) When acquiring a product or service that could be classified in two or more industries with different size standards, contracting officers shall apply the size standard for the industry accounting for the greatest percentage of the contract price.

(e) If a solicitation calls for more than one item and allows offers to

be submitted on any or all of the items, an offeror must meet the size standard for each item it offers to furnish. If a solicitation calling for more than one item requires offers on all or none of the items, an offeror may qualify as a small business meeting the size standard for the item accounting for the greatest percentage of the total contract price.

(f) Any concern which submits a bid or offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is deemed to be a small business when--

(1) In the case of Government acquisitions set-aside for small businesses, such nonmanufacturer must furnish in the performance of the contract the product of a small business manufacturer or producer, which end product must be manufactured or produced in the United States. The term "nonmanufacturer" includes a concern which can manufacture or produce the product referred to in the specific acquisition but does not do so in connection with that acquisition. For size determination purposes there can be only one manufacturer of the end item being procured. The manufacturer of the end item being acquired is the concern which, with its own forces, transforms inorganic or organic substances including raw materials and/or miscellaneous parts or components into such end item. Whether a bidder on a particular acquisition is the manufacturer or a nonmanufacturer for the purpose of a size determination need not be consistent with whether such concern is or is not a manufacturer for the purpose of the Walsh-Healey Act.

(2) A concern which packages items and packages them into a kit is considered to be a nonmanufacturer small business and can qualify as such for a given acquisition if it meets the size qualifications of a small nonmanufacturer for acquisition, and if more than 50 percent of the total value of the kit and its contents is accounted for by items manufactured by small business.

(3) If the acquisition is subject to and is actually procured under "small purchase procedures," such nonmanufacturer may furnish any domestically produced or manufactured product.

(4) For the purpose of receiving a Certificate of Competency on an unrestricted acquisition, a small business nonmanufacturer may furnish any domestically produced or manufactured product. The applicable size standard shall be that of the wholesale industry of the item being acquired.

23.2 The industry size standards are set forth in the following table. The table column labeled "SIC" follows the standard industrial classification code as published by the Government in the Standard Industrial Classification Manual. The Manual is intended to cover the entire field of economic activities. It classifies and defines activities by industry categories and is the source used by SBA as a guide in defining industries for size standards. The number of employees or annual receipts indicates the maximum allowed for a concern, including its affiliates, to be considered small.

23.3 Size standards for construction and special trades.

A concern is small if its average annual receipts for its preceding 3 fiscal years did not exceed $17 million. However, if 75 percent or more of the work (in terms of dollar value) called for by the contract is classified in one of the industries, subindustries, or classes of products listed in this paragraph, the concern is small if its average annual receipts for its preceding 3 fiscal years did not exceed the size standard for that industry, subindustry, or class of products. (See Division C, "Contract Construction," of the SIC Manual).

Classification Code	Industry, Subindustry, or Class of Products	Size Standard*

MAJOR GROUP 15--BUILDING CONSTRUCTION--GENERAL CONTRACTORS AND OPERATIVE BUILDERS

1521	General Contractors--Single-Family House	$17.0
1522	General Contractors--Residential Buildings, Other Than Single-Family	17.0
1531	Operative Builders	17.0
1541	General Contractors--Industrial Buildings and Warehouses	17.0
1542	General Contractors--Nonresidential Buildings Other Than Industrial Buildings and Warehouse	17.0

MAJOR GROUP 16--CONSTRUCTION OTHER THAN BUILDING CONSTRUCTION--GENERAL CONTRACTORS

1611	Highway and Street Construction, Except Elevated Highway	17.0
1622	Bridge, Tunnel, and Elevated Highway Construction	17.0
1623	Water, Sewer, Pipe Line, Communication and Power Line Construction	17.0
1629	Heavy Construction, Except Dredging N.E.C.	17.0
1629	Dredging and Surface Cleanup Activities	13.5

MAJOR GROUP 17--CONSTRUCTION--SPECIAL TRADE CONTRACTORS

1711	Plumbing, heating (except electric), and air conditioning	$7
1721	Painting, paperhanging, and decorating	7
1731	Electrical Work	7
1741	Masonry, stone setting, and other stonework	7
1742	Plastering, drywall, acoustical and insulation work	7
1743	Terrazzo, tile, marble, and mosaic work	7
1751	Carpentering and flooring	7
1752	Floor laying and other floorwork, not elsewhere classified	7
1761	Roofing and sheet metal work	7
1771	Concrete work	7
1781	Water well drilling	7
1791	Structural steel erection	7
1793	Glass and glazing work	7
1794	Excavating and foundation work	7
1795	Wrecking and demolition work	7
1796	Installation or erection of building equipment, not elsewhere classified	7
1799	Special trade contractors, not elsewhere classified	7

* (Average Annual Receipts) (Millions)

24. CONTRACT PRICES - BIDDING SCHEDULES (DEC 1991) DFARS 52.236-7008.

(a) The Government's payment for the items listed in the Bidding Schedule shall constitute full compensation to the Contractor for--

(1) Furnishing all plant, labor, equipment, appliances, and materials; and

(2) Performing all operations required to complete the work in conformity with the drawings and specifications.

(b) The Contractor shall include in the prices for the items in the Bidding Schedule all costs for work in the specifications, whether or not specifically listed in the Bidding Schedule.

2 Jan 96
25. ARITHMETIC DISCREPANCIES EFARS 52.214-5000.

(a) For the purpose of initial evaluations of bids, the following will be utilized in resolving arithmetic discrepancies found on the face of the bidding schedule as submitted by the bidder:

(1) Obviously misplaced decimal points will be corrected;

(2) In case of discrepancy between unit prices and extended price, the unit price will govern;

(3) Apparent errors in extension of unit prices will be corrected; and

(4) Apparent errors in addition of lump-sum and extended prices will be corrected.

(b) For the purposes of bid evaluation, the Government will proceed on the assumption that the bidder intends his bid to be evaluated on the basis of the unit prices, the totals arrived at by resolution of arithmetic discrepancies as provided above and the bid will be so reflected on the abstract of bids.

(c) These correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

1 February 1995
26. WAGE RATES. The Wage Decisions of the Secretary of Labor are applicable to the work to be performed under this contract and are contained in SECTION 00800, SPECIAL CONTRACT REQUIREMENTS. Modifications are periodically made to the wage decisions. The complete modifications will be issued by amendment to the solicitation.

27. MODIFICATIONS PRIOR TO DATE SET FOR OPENING BIDS. The right is reserved, as the interest of the Government may require, to revise or amend the specifications and/or drawings prior to the date set for opening of bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to this Invitation for Bids. Copies of such amendments as may be issued will be furnished to all prospective bidders. If the revisions and amendments are of a nature which require material changes in quantities or prices bid or both, the date set for opening bids may be postponed by such number of days as in the opinion of the District Engineer will enable bidders to revise their bids. In such cases, the amendment will include an announcement of the new date for opening bids.

28. NOTICE REGARDING BUY AMERICAN ACT. The Buy American Act (41 U.S.C. 10a-10d) generally requires that only domestic construction material be used in the performance of this contract. Exception from the Buy American Act shall be permitted only in the case of nonavailability of domestic construction materials. A bid or proposal offering nondomestic construction material will not be accepted unless specifically approved by the Government. When a bidder or offeror proposes to furnish non-domestic construction materials, his bid or proposal must set forth an itemization of the quantity, unit price, and intended use of each item of such nondomestic construction material. When offering nondomestic construction material pursuant to this paragraph, bids or proposals may also offer, at stated prices, any available comparable domestic construction material, so as to avoid the possibility that failure of a nondomestic construction material to be acceptable under this paragraph will cause rejection of the entire bid.

29. LISTING OF EMPLOYMENT OPENINGS. Offerors should note that this solicitation includes a provision requiring the listing of employment

openings with the local office of the State employment service system if the award is for $10,000 or more.

30. NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (APR 1984) FAR 52.222-23.

(a) The Offeror's attention is called to the EQUAL OPPORTUNITY and the AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION clauses of this solicitation.

(b) The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

.....

Goals for minority participation for each trade	Goals for female participation in each trade
4.8%	6.9%

.....

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or Federally assisted) performed in the covered area. If the Contractor performs construction work (whether or not it is Federal or Federally assisted) in a geographical area located outside the covered area, it shall apply the goals established for the geographical area where such work is actually performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs (OFCCP) Office.

(c) The Contractor's compliance with Executive Order 11246 as amended and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity clause, specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction" and its efforts to meet prescribed goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

(d) The Contractor shall provide written notification to the Director, OFCCP within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor, employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in the contract resulting from this Solicitation, the "covered area" is Springfield, MA which includes Hampden County, MA.

2 Jan 96
31. SUBCONTRACTING PLANS FOR SMALL, SMALL DISADVANTAGED, AND WOMEN-OWNED SMALL BUSINESS CONCERNS. Bidders are cautioned that compliance with CONTRACT CLAUSE: SMALL, SMALL DISADVANTAGED, AND WOMEN-OWNED SMALL BUSINESS

SUBCONTRACTING PLAN requires that the apparent low bidder, upon request by the Contracting Officer, submit a subcontracting plan for subcontracting with small, small disadvantaged, and women-owned small business concerns. Bidders desiring assistance in developing a source list are encouraged to contact small business, small disadvantaged, and women-owned small business associations and appropriate Offices of Small and Disadvantaged Business Utilization, addresses which may be obtained from the District Labor Adviser, U.S. Army Engineer District, P.O. Box 59, Louisville, Kentucky 40201 (Telephone 502/582-5679).

32. PERFORMANCE OF WORK BY CONTRACTOR. Attention is directed to SPECIAL CONTRACT REQUIREMENT: PERFORMANCE OF WORK BY CONTRACTOR. The apparent low bidder must furnish the Contracting Officer, within 5 working days after bid opening, a description of the work which he intends to perform with his own organization, e.g., earthwork, paving, brickwork, or roofing), the percentage of the total work this represents, and the estimated cost thereof.

33. NOT USED.

15 September 1995
34. MODIFICATION OF BIDS BY FACSIMILE. Bidders WILL NOT be allowed to modify their bids at any time by facsimile or teletype.

35. PAYMENT FOR BOND PREMIUMS. CONTRACT CLAUSE: PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS provides that upon presentation of evidence of full payment, the Government will immediately reimburse the Contractor the cost of premiums for performance and payment bonds. This reimbursement amount is not in addition to the amount bid for the work covered by this Invitation for Bids, and bidders are cautioned to include the cost of such premiums in the bid items shown on the Bidding Schedule (or in the lump sum amount of the bid if no bid items are listed). If bond premiums are reimbursed under this clause, such reimbursed amount will be recovered by the Government from the progress payments made to the Contractor or, if no progress payments are made, from the amount otherwise due the Contractor upon final payment.

36. NOT USED.

37. BRAND NAME OR EQUAL (DEC 1991) DFARS 252.211-7003.

(a) If items in this solicitation are identified as “brand name or equal,” the term is intended to be descriptive not restrictive. The “brand name or equal” description is used to portray the characteristics and level of quality that will satisfy the Government’s needs. The salient physical, functional, and other characteristics which “equal” products must meet are specified in the solicitation.

(b) To be considered for award, offers of “equal” products, including products (other than the “brand name” item) of the brand name manufacturer, must--

(1) Meet the salient physical, functional, and other characteristics specified in this solicitation;

(2) Clearly identify the item by--

(i) Brand name, if any; and

(ii) Make or model number;

(3) Include descriptive literature such as cuts, illustrations, drawings, or a clear reference to previously furnished descriptive data or information available to the Contracting Officer; and

(4) Clearly describe any modifications the Offeror plans to make in a product to make it conform to the solicitation requirements. Mark any descriptive material to clearly show the modifications

(c) The Contracting Officer will evaluate “equal” products on the basis of information furnished by the Offer or identified in the offer and reasonably available to the Contracting Officer. The Contracting Officer is not responsible for locating or securing any information not identified in the offer and reasonably available.

(d) Unless the Offeror clearly indicates in the offer that the product being offered is an “equal” product, the Contracting Officer will consider the offer as offering a brand name product referenced in the solicitation.

20 March 1997
38. SERVICE OF PROTEST (AUG 1996) FAR 52.233-2.

(a) Protests, as defined in Section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO) shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from:

Ms. Denise A. Bauer, Contracting Officer
U.S. Army Engineer District, Louisville
Corps of Engineers - ATTN: CEORLCT
600 Dr. Martin Luther King Jr. Place, Room 821
Louisville, Kentucky 40202-2230

(b) The copy of any protest shall be received in the office designated above on the same day a protest is filed with the GSBCA or within one day of filing a protest with the GAO.

39. COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE REPORTING (DEC 1991) DFARS 252.204-7001

(a) The Offeror is requested to enter its CAGE code on its offer in the block with its name and address. The CAGE code entered must be for that name and address. Enter CAGE before the number.

(b) If the Offeror does not have a CAGE code, it may ask the Contracting Officer to request one from the Defense Logistics Services Center (DLSC). The Contracting Officer will--

(1) Ask the Contractor to complete section B of a DD Form 2051, Request for Assignment of a Commercial and Government Entity (CAGE) Code;

(2) Complete section A and forward the form to DLSC; and

(3) Notify the Contractor of its assigned CAGE code.

(c) Do not delay submission of the offer pending receipt of a CAGE code.

20 March 1997
40. DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER (APR 1998) FAR 52.204-6.

(a) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation “DUNS” followed by the DUNS number that identifies the offeror’s name and address exactly as stated in the offer. The DUNS number is a nine-digit number assigned by Dun and Bradstreet Information Services.

(b) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one. A DUNS number will be provided immediately

by telephone at no charge to the offeror. For information on obtaining a DUNS number, the offeror, if located within the United States, should call Dun and Bradstreet at 1-800-333-0505. The offeror should be prepared to provide the following information:

(1) Company name.
(2) Company address.
(3) Company telephone number.
(4) Line of business.
(5) Chief executive officer/key manager.
(6) Date the company was started.
(7) Number of people employed by the company.
(8) Company affiliation.

(c) Offerors located outside the United States may obtain the location and phone number of the local Dun and Bradstreet Information Services office from the Internet Home Page at hhtp://www.dnb.com/. If an offeror is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at globalinfo@mail.dnb.com.

41. NOT USED.

20 March 1997
42. NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (SEP 1990) FAR 52.211-14.

42.1 Any contract awarded as a result of this solicitation will be a [ ] DX rated order; [X] DO-C2 rated order certified for national defense use under the Defense Priorities and Allocations System (DFARS) 15 CFR 700, and the Contractor will be required to follow all of the requirements of this regulation.

43. PRICE BASIS. Prices must be firm. Bids will not be considered which provide for subsequent increase in price.

2 Aug 1997
44. CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION (AUG 1996) FAR 52.214-19.

44.1 The Government will evaluate bids in response to this solicitation without discussions and will award a contract to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the Government, considering only price, price-related factors specified elsewhere in the solicitation.

44.2 The Government may reject any or all bids, and waive informalities on minor irregularities in bids received.

44.3 The Government may accept any item or combination of items, unless doing so is precluded by a restrictive limitation in the solicitation or the bid.

44.4 The Government may reject a bid as nonresponsive if the prices bid are materially unbalanced between line items or subline items. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the bid will result in the lowest overall cost to the Government even though it may be the low evaluated bid, or if it is so unbalanced as to be tantamount to allowing an advance payment.

45. RESTRICTIVE LIMITATION (Ref. Sect. 00120, Para. 44.3). Except for Additives and Options, the Government shall accept all items listed in SECTION 00010 of this solicitation.

46. AWARD TO SINGLE BIDDERS. Subject to the provisions contained herein, award shall be made to a single bidder.

47. NOT USED.

20 March 1997
48. EVALUATION OF OPTIONS (JUL 1990) FAR 52.217-5
Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. Evaluation of options will not obligate the Government to exercise the option(s).

49. NOT USED.

LOCATION OF BID OPENING. Bidders are provided the following information as a service by the government. The government cannot be held liable for street closures, traffic delays or other problems that may be encountered due to reliance upon the government's suggested routes to the Federal Building.

Motorist coming from I-65 North:

Immediately after crossing the kennedy bridge, take exit I-64 West (St. Louis). Once in I-64, take the 9th street exit. Continue straight on 9th street for approximately seven blocks to Broadway (first major street with two-way traffic). Turn left on Broadway; go two blocks and turn left on 7th street (7th street is one-way north bound). Approximately ½ block north on 7th street is a stop light, our building is on the right just past the light. There should be ample parking available either by street-side or garage parking. Upon entering the building proceed to the eighth floor and go to room 821.

Motorist coming from I-65 South:

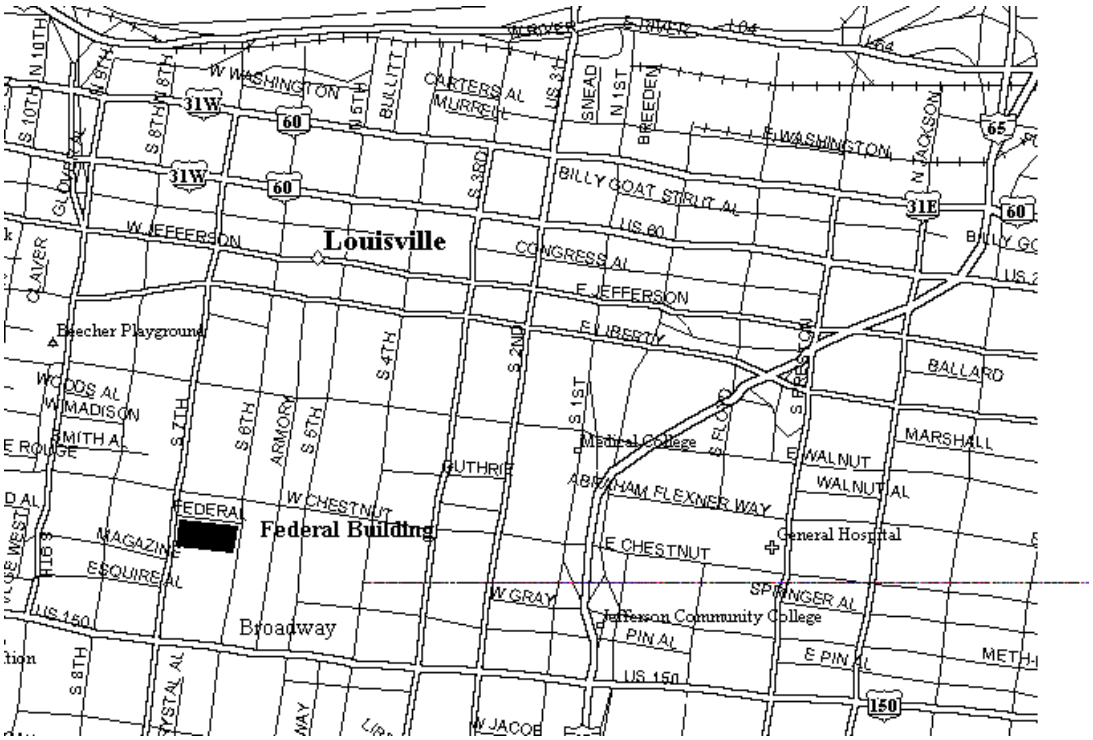
Take Broadway exit and turn left on Broadway (west bound) and continue to 7th street and turn right. Approximately ½ block north on 7th street is a stop light, our building is on the right just past the light. There should be ample parking available either by street-side or garage parking. Upon entering the building proceed to the eighth floor and go to room 821.

Motorist coming from I-64 East and West:

Exit the 9th street exit. At the bottom of the ramp continue south down 9th street for approximately seven blocks until you come to Broadway (first major two way street). Turn left on Broadway and to two blocks and turn left on 7th street (7th street is one-way north bound). Approximately ½ block north on 7th street is a stop light, our building is on the right just past the light. There should be ample parking available either by street-side or garage parking. Upon entering the building proceed to the eighth floor and go to room 821.

Motorist coming from I-71:

Follow routing for intersecting with I-64 and follow the instructions for I-64 motorists.



BIDDER: READ CAREFULLY - CHECK ALL APPLICABLE BOXES

SECTION 00605

REPRESENTATIONS, CERTIFICATIONS, AND OTHER STATEMENTS OF BIDDER (SEALED BID)

DATE OF OFFER: _____ DUNS NO. _____

SOLICITATION NO. _____ CAGE NO. _____

NAME AND ADDRESS OF OFFEROR: _____

_____

The offeror makes the following representations and certifications as part of the offer referenced above.

1. CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (APR 1985) FAR 52.203-2

(a) The offeror certifies that--

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to (i) those prices, (ii) the intention to submit an offer, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory--

(1) Is the person in the offeror’s organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision _____ [*insert full name of person(s) in the offeror’s organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror’s organization*];

(ii) As an authorized agent, does certify that the principals name in subdivision (b)(2)(i) of this provision have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision.

(c) If the offeror deletes or modifies subparagraph (a)(2) of this provision, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

(End of provision)

2. CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (APR 1991) FAR 52.203-11

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989--

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

(End of Provision)

3. TAXPAYER IDENTIFICATION (JUN 1997) FAR 52.204-3

(a) **Definitions.**

“Common parent,” as used in this solicitation provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

“Corporate status,” as used in this solicitation provision, means a designation as to whether the offeror is a corporate entity, an unincorporated entity (e.g., sole proprietorship or partnership), or a corporation providing medical and health care services.

“Taxpayer Identification Number (TIN),” as used in this solicitation provision, means the number required by the IRS to be used by the offeror in reporting income tax and other returns.

(b) All offerors are required to submit the information required in paragraphs (c) through (e) of this solicitation provision in order to comply with reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M and implementing regulations issued by the Internal Revenue Service (IRS). If the resulting contract is subject to the reporting requirements described in FAR 4.903, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) **Taxpayer Identification Number (TIN).**

[ ] TIN: _____
[ ] TIN has been applied for.
[ ] TIN is not required because:
- **[ ]** Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the U.S. and does not have an office or place of business or a fiscal paying agent in the U.S.;
- **[ ]** Offeror is an agency or instrumentality of a foreign government;
- **[ ]** Offeror is an agency or instrumentality of a Federal, state, or local government;
- **[ ]** Other. State basis.
  _____

(d) **Corporate Status.**

[ ] Corporation providing medical and health care services, or engaged in the billing and collecting of payments for such services;
[ ] Other corporate entity;
[ ] Not a corporate entity:
- **[ ]** Sole proprietorship
- **[ ]** Partnership
- **[ ]** Hospital or extended care facility described in 26 CFR 501(c)(3) that is exempt from taxation under 26 CFR 501(a).

(e) **Common Parent.**

[ ] Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this provision.
[ ] Name and TIN of Common parent:

Name _____ TIN_____

(End of provision)

4. WOMEN-OWNED BUSINESS (OCT 1995) FAR 52.204-5

(a) **Representation.** The offeror represents that it **[ ]** is, **[ ]** is not a women-owned business concern.

(b) **Definition.** “Women-owned business concern,” as used in this provision, means a concern which is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

(End of provision)

5. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (MAR 1996) FAR 52.209-5

(a) (1) The Offeror certifies, to the best of its knowledge and belief, that--

(i) The Offeror and/or any of its Principals--

(A) Are **[ ]** are not **[ ]** presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have **[ ]** have not **[ ]**, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are **[ ]** are not **[ ]** presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(ii) The Offeror has **[ ]** has not **[ ]**, within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) “Principals,” for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror’s responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

(End of provision)

6. DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (SEP 1994) DFARS 252.209-7001

(a) **Definitions.**

As used in this provision--

(1) “Government of a terrorist country” includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereof.

(2) “Terrorist country” means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 (50 U.S.C. App. 2405 (j)(i)(A)), to be a country the government of which has repeatedly provided support for acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria.

(3) “Significant interest” means--

(i) Ownership of or beneficial interest in 5 percent or more of the firm’s or subsidiary’s securities. Beneficial interest includes holding 5 percent or more of any class of the firm’s securities in “nominee shares,” “street names,” or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) **Prohibition on award.** In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) **Disclosure.** If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to its offer. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include--

(1) Identification of each government holding a significant interest; and

(2) A description of the significant interest held by each government.

(End of provision)

7. TYPE OF BUSINESS ORGANIZATION - SEALED BIDDING (JUL 1987) FAR 52.214-2

The bidder, by checking the applicable box, represents that--

(a) It operates as **[ ]** a corporation incorporated under the laws of the State of _____, **[ ]** an individual **[ ]** a partnership, **[ ]** a nonprofit organization, or **[ ]** a joint venture; or

(b) If the bidder is a foreign entity, it operates as **[ ]** an individual, **[ ]** a partnership, **[ ]** a nonprofit organization, **[ ]** a joint venture, or **[ ]** a corporation, registered for business in _____.
(country)

(End of provision)

8. SMALL BUSINESS PROGRAM REPRESENTATIONS (APR 1998) FAR 52.219-1

(a) (1) The standard industrial classification (SIC) code for this acquisition is 1629.

(2) The small business size standard is $17.0 million.

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) **Representations.** (1) The offeror represents as part of its offer that it **[ ]** is, **[ ]** is not a small business concern.

(2) (Complete only if offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it **[ ]** is, **[ ]** is not a small disadvantaged business concern.

(3) (Complete only if offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it **[ ]** is **[ ]** is not a women-owned small business concern.

(c) **Definitions.** “Joint venture,” for purposes of a small disadvantaged business (SDB) set-aside or price evaluation preference (as prescribed at 13 CFR 124.321), is a concern that is owned and controlled by one or more socially and economically disadvantaged individuals entering into a joint venture agreement with one or more business concerns and is considered to be affiliated for size purposes with such other concern(s). The combined annual receipts or employees of the concerns entering into the joint venture must meet the applicable size standard corresponding to the SIC code designated for the contract. The majority of the venture’s earnings must accrue directly to the socially and economically disadvantaged individuals in the SDB concerns(s) in the joint venture. The percentage of the ownership involvement in a joint venture by disadvantaged individuals must be at least 51 percent.

“Small business concern,” as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

“Small disadvantaged business concern,” as used in this provision, means a small business concern that (1) is at least 51 percent unconditionally owned by one or more individuals who are both socially and economically disadvantaged, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more socially and economically disadvantaged individuals, and (2) has its management and daily business controlled by one or more such individuals. This term also means a small business concern that is at least 51 percent unconditionally owned by an economically disadvantaged Indian tribe or Native Hawaiian Organization, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more of these entities, which has its management and daily business controlled by members of an economically disadvantaged Indian tribe or Native Hawaiian Organization, and which meets the requirements of 13 CFR Part 124.

“Woman-owned small business concern,” as used in this provision, means a small business concern--

(1) Which is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) **Notice.** (1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm’s status as a small or small disadvantaged business concern in order to obtain a contract to be awarded under the preference programs

established pursuant to sections 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall--

(i) Be punished by imposition of fine, imprisonment, or both;

(ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.

(End of provision)

9. EQUAL LOW BIDS (OCT 1995) FAR 52.219-2

(a) This provision applies to small business concerns only.

(b) The bidder’s status as a labor surplus area (LSA) concern may affect entitlement to award in case of tie bids. If the bidder wishes to be considered for this priority, the bidder must identify, in the following space, the LSA in which the costs to be incurred on account of manufacturing or production (by the bidder or the first-tier subcontractors) amount to more than 50 percent of the contract price.

_____ _____

_____ _____

(c) Failure to identify the labor surplus areas as specified in paragraph (b) of this provision will preclude the bidder from receiving priority consideration. If the bidder is awarded a contract as a result of receiving priority consideration under this provision and would not have otherwise received award, the bidder shall perform the contract or cause the contract to be performed in accordance with the obligations of an LSA concern.

(End of provision)

10. SMALL BUSINESS CONCERN REPRESENTATION FOR THE SMALL BUSINESS COMPETITIVENESS DEMONSTRATION PROGRAM (JAN 1997) FAR 52.219-19

(a) **Definition.** “Emerging small business” as used in this solicitation, means a small business concern whose size is no greater than 50 percent of the numerical size standard applicable to the standard industrial classification code assigned to a contracting opportunity.

(b) **(Complete only if the Offeror has represented itself under the provision at 52.219-1 as a small business concern under the size standards of this solicitation.)** The Offeror **[ ]** is, **[ ]** is not an emerging small business.

(c) **(Complete only if the Offeror is a small business or an emerging small business, indicating its size range.)** Offeror’s number of employees for the past 12 months (check this column if size standard stated in solicitation is expressed in terms of number of employees) or Offeror’s average annual gross revenue for the last 3 fiscal years (check this column if size standard stated in solicitation is expressed in terms of annual receipts - see paragraph 11(a) (2) Small Business Program Representations).

Number of Employees	Avg. Annual Gross Revenues
_____ 50 or fewer	_____ $1 million or less
_____ 51 - 100	_____ $1,000,001 - $2 million
_____ 101 -250	_____ $2,000,001 - $3.5 million
_____ 251 - 500	_____ $3,500,001 - $5 million
_____ 501 - 750	_____ $5,000,001 - $10 million
_____ 751 - 1,000	_____ $10,000,001 - $17 million
_____ Over 1,000	_____ Over $17 million

(End of provision)

11. SMALL DISADVANTAGED BUSINESS CONCERN REPRESENTATION (DoD CONTRACTS) (JUN 1997) DFARS 252.219-7000

(a) **Definition.** “Small disadvantaged business concern,” as used in this provision, means a small business concern, owned and controlled by individuals who are both socially and economically disadvantaged, as defined by the Small Business Administration at 13 CFR Part 124, the majority of earnings of which directly accrue to such individuals. This term also means a small business concern owned and controlled by an economically disadvantaged Indian tribe or Native Hawaiian organization which meets the requirements of 13 CFR 124.112 or 13 CFR 124.113, respectively. In general, 13 CFR Part 124 describes a small disadvantaged business concern as a small business concern--

(1) Which is at least 51 percent unconditionally owned by one or more socially and economically disadvantaged individuals; or

(2) In the case of any publicly owned business, at least 51 percent of the voting stock is unconditionally owned by one or more socially and economically disadvantaged individuals; and

(3) Whose management and daily business operations are controlled by one or more such individuals.

(b) **Representations.** Check the category in which your ownership falls--

_____ Subcontinent Asian (Asian-Indian) American (U.S. citizen with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal)

_____ Asian-Pacific American (U.S. citizen with origins from Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, U.S. Trust Territory of the Pacific Islands (Republic of Palau), the Northern Mariana Islands, Laos, Kampuchea (Cambodia), Taiwan, Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Republic of the Marshall Islands, the Federated States of Micronesia, Macao, Hong Kong, Fiji, Tonga, Kiribati, Tuvalu, or Nauru)

_____ Black American (U.S. citizen)

_____ Hispanic American (U.S. citizen with origins from South American, Central America, Mexico, Cuba, the Dominican Republic, Puerto Rico, Spain, or Portugal)

_____ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians, including

Indian tribes or Native Hawaiian organizations)

_____ Individual/concern, other than one of the preceding, currently certified for participation In the Minority Small Business and Capital Ownership Development Program under Section 8(a) of the Small Business Act.

_____ Other

(c) Complete the following--

(1) The offeror is **[ ],** is not **[ ]** a small disadvantaged business concern.

(2) The Small Business Administration (SBA) has **[ ]** has not **[ ]**made a determination concerning the offeror’s status as a small disadvantaged business concern. If the SBA has made a determination, the date of the determination was _____ and the offeror--

_____ Was found by SBA to be socially and economically disadvantaged and no circumstances have changed to vary that determination.

_____ Was found by SBA not to be socially and economically disadvantaged but circumstances which caused the determination have changed.

(d) **Penalties and Remedies.** Anyone who misrepresents the status of a concern as a small disadvantaged business for the purpose of securing a contract or subcontract shall--

(1) Be punished by imposition of a fine, imprisonment, or both;

(2) Be subject to administrative remedies, including suspension and debarment; and

(3) Be ineligible for participation in programs conducted under authority of the Small Business Act.

(End of Provision)

12. CERTIFICATION OF NONSEGREGATED FACILITIES (APR 1984) FAR 52.222-21

(a) “Segregated facilities,” as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

(b) By the submission of this offer, the offeror certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The offeror agrees that a breach of this certification is a violation of the Equal Opportunity clause in the contract.

(c) The offeror further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will--

(1) Obtain identical certifications from proposed subcontractors before the award of subcontracts under which the subcontractor will be subject to the Equal Opportunity clause;

(2) Retain the certifications in the files; and

(3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT
FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract under which the subcontractor will be subject to the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).
NOTE: The penalty for making false statements in offers is prescribed in 18. U.S.C. 1001.

(End of Provision)

13. PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (APR 1984) FAR 52.222-22

The offeror represents that--

(a) It **[ ]** has **[ ]** has not, participated in a previous contract or subcontract subject either to the Equal Opportunity clause of this solicitation, the clause originally contained in Section 310 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114;

(b) It **[ ]** has, **[ ]** has not, filed all required compliance reports; and

(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

(End of Provision)

14. CLEAN AIR AND WATER CERTIFICATION (APR 1984) FAR 52.223-1

The Offeror certifies that--

(a) Any facility to be used in the performance of this proposed contract **[ ]** is, **[ ]** is not listed on the Environmental Protection Agency (EPA) List of Violating Facilities;

(b) The Offeror will immediately notify the Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the EPA, indicating that any facility that the Offeror proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and

(c) The Offeror will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

(End of Provision)

15. CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (OCT 1996)

FAR 52.223-13

(a) Submission of this certification is a prerequisite for making or entering into this contract imposed by Executive Order 12969, August 8,1995.

(b) By signing this offer, the offeror certifies that--

(1) As the owner or operator of facilities that will be used in the performance of this contract that are subject to the filing and reporting requirements described in section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106), the offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of EPCRA and section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facilities is exempt for at least one of the following reasons: *(Check each block that is applicable.)*

[ ] (i) The facility does not manufacture, process or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

[ ] (ii) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

[ ] (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

[ ] (iv) The facility does not fall within the Standard Industrial Classification Code (SIC) designations 20 through 39 as set forth in section 19.102 of the Federal Acquisition Regulation; or

[ ] (v) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

(End of provision)

16. REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992) DFARS 252.247-7022

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term “supplies” is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) **Representation.** The Offeror represents that it--

[ ] Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

[ ] Does not anticipate that supplies will be transported by sea in the performance of any Contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

(End of Provision)

(End of Section 00605)

SECTION 00700

INDEX OF CONTRACT CLAUSES (CONSTRUCTION)
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1. CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991) DFARS 252.201-7000

(a) *Definition*. "Contracting officer's representative" means an individual designated in accordance with subsection 201.602-2 of the Defense Federal Acquisition Regulation Supplement and authorized in writing by the Contracting Officer to perform specific technical or administrative functions.

(b) If the Contracting Officer designates a Contracting Officer's Representative (COR), the Contractor will receive a copy of the written designation. It will specify the extent of the COR's authority to act on behalf of the Contracting Officer. The COR is not authorized to make any commitments or changes that will affect price, quality, quantity, delivery, or any other term or condition of the contract.

(End of clause)

2. DEFINITIONS (OCT 1995)--ALTERNATE I (APR 1984) FAR 52.202-1 I

(a) "Head of the agency" (also called "agency head") or "Secretary" means the Secretary (or Attorney General, Administrator, Governor, Chairperson, or other chief official, as appropriate) of the agency, including any deputy or assistant chief official of the agency; and the term "authorized representative" means any person, persons, or board (other than the Contracting Officer) authorized to act for the head of the agency or Secretary.

(b) "Commercial component" means any component that is a commercial item.

(c) "Component" means any item supplied to the Federal Government as part of an end item or of another component.

(d) "Nondevelopmental item" means--

(1) Any previously developed item of supply used exclusively for governmental purposes by a Federal agency, a State or local government, or a foreign government with which the United States has a mutual defense cooperation agreement;

(2) Any item described in paragraph (d)(1) of this definition that requires only minor modification or modifications of a type customarily available in the commercial marketplace in order to meet the requirements of the procuring department or agency; or

(3) Any item of supply being produced that does not meet the requirements of paragraph (d)(1) or (d)(2) solely because the item is not yet in use.

(e) "Contracting Officer" means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.

(f) Except as otherwise provided in this contract, the term "subcontracts" includes, but is not limited to, purchase orders and changes and modifications to purchase orders under this contract.

(End of clause)

3. GRATUITIES (APR 1984) FAR 52.203-3

(a) The right of the Contractor to proceed may be terminated by written notice if, after notice and hearing, the agency head or a designee determines that the Contractor, its agent, or another representative--

(1) Offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official, or employee of the Government; and

(2) Intended, by the gratuity, to obtain a contract or favorable treatment under a contract.

(b) The facts supporting this determination may be reviewed by any court having lawful jurisdiction.

(c) If this contract is terminated under paragraph (a) of this clause, the Government is entitled--

(1) To pursue the same remedies as in a breach of the contract; and

(2) In addition to any other damages provided by law, to exemplary damages of not less than 3 nor more than 10 times the cost incurred by the Contractor in giving gratuities to the person concerned, as determined by the agency head or a designee. (This subparagraph (c)(2) is applicable only if this contract uses money appropriated to the Department of Defense.)

(d) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

4. COVENANT AGAINST CONTINGENT FEES (APR 1984) FAR 52.203-5

(a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annual this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.

(b) "Bona fide agency," as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract or any basis other than the merits of the matter.

(End of clause)

5. ANTI-KICKBACK PROCEDURES (JUL 1995) FAR 52.203-7

(a) *Definitions*.

"Kickback," as used in this clause, means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided, directly or indirectly, to any prime Contractor, prime Contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a subcontract relating to a prime contract.

"Person," as used in this clause, means a corporation, partnership, business association of any kind, trust, joint-stock company, or individual.

"Prime contract," as used in this clause, means a contract or contractual action entered into by the United States for the purpose of obtaining supplies, materials, equipment or services of any kind.

"Prime Contractor" as used in this clause, means a person who has entered into a prime contract with the United States.

"Prime Contractor employee," as used in this clause, means any officer, partner, employee, or agent of a prime Contractor.

"Subcontract," as used in this clause, means a contract or contractual action entered into by a prime Contractor or subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind under a prime contract.

"Subcontractor," as used in this clause, (1) means any person, other than the prime Contractor, who offers to furnish or furnishes any supplies, materials, equipment, or services of any kind under a prime contract or a subcontract entered into in connection with such prime contract, and (2) includes any person who offers to furnish or furnishes general supplies to the prime Contractor or a higher tier subcontractor.

"Subcontractor employee," as used in this clause, means any officer, partner, employee, or agent of a subcontractor.

(b) The Anti-Kickback Act of 1986 (41 U.S.C. 51-58) (the Act), prohibits any person from--

(1) Providing or attempting to provide or offering to provide any kickback;

(2) Soliciting, accepting, or attempting to accept any kickback; or

(3) Including, directly or indirectly, the amount of any kickback in the contract price charged by a prime Contractor to the United States or in the contract price charged by a subcontractor to a prime Contractor or higher tier subcontractor.

(c)(1) The Contractor shall have in place and follow reasonable procedures designed to prevent and detect possible violations described in paragraph (b) of this clause in its own operations and direct business relationships.

(2) When the Contractor has reasonable grounds to believe that a violation described in paragraph (b) of this clause may have occurred, the Contractor shall promptly report in writing the possible violation. Such reports shall be made to the inspector general of the contracting agency, the head of the contracting agency if the agency does not have an inspector general, or the Department of Justice.

(3) The Contractor shall cooperate fully with any Federal agency investigating a possible violation described in paragraph (b) of this clause.

(4) The Contracting Officer may (i) offset the amount of the kickback against any monies owed by the United States under the prime contract and/or (ii) direct that the Prime Contractor withhold from sums owed a subcontractor under the prime contract the amount of the kickback. The Contracting Officer may order that monies withheld under subdivision (c)(4)(ii) of this clause be paid to the Government unless the Government has already offset those monies under subdivision (c)(4)(i) of this clause. In either case, the Prime Contractor shall notify the Contracting Officer when the monies are withheld.

(5) The Contractor agrees to incorporate the substance of this clause, including subparagraph (c)(5) but excepting subparagraph (c)(1), in all subcontracts under this contract which exceed $100,000.

(End of clause)

6. CANCELLATION, RESCISSION, AND RECOVERY OF FUNDS FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997) FAR 52.203-8

(a) If the Government receives information that a contractor or a person has engaged in conduct constituting a violation of subsection (a), (b), (c), or (d) of Section 27 of the Office of Federal Procurement Policy Act (41 U.S.C. 423) (the Act), as amended by section 4304 of the 1996 National Defense Authorization Act for Fiscal Year 1996 (Pub.L. 104-106), the Government may--

(1) Cancel the solicitation, if the contract has not yet been awarded or issued; or

(2) Rescind the contract with respect to which--

(i) The Contractor or someone acting for the Contractor has been convicted for an offense where the conduct constitutes a violation of subsection 27 (a) or (b) of the Act for the purpose of either--

(A) Exchanging the information covered by such subsections for anything of value; or

(B) Obtaining or giving anyone a competitive advantage in the award of a Federal agency procurement contract; or

(ii) The head of the contracting activity has determined, based upon a preponderance of the evidence, that the Contractor or someone acting for the Contractor has engaged in conduct constituting an offense punishable under subsections 27(e) (1) of the Act.

(b) If the Government rescinds the contract under paragraph (a) of this clause, the Government is entitled to recover, in addition to any penalty prescribed by law, the amount expended under the contract.

(c) The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law, regulation, or under this contract.

(End of clause)

7. PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997) FAR 52.203-10

(a) The Government, at its election, may reduce the price of a fixed-price type contract and the total cost and fee under a cost-type contract by the amount of profit or fee determined as set forth in paragraph (b) of this clause if the head of the contracting activity or designee determines that there was a violation of subsection 27(a), (b), or (c) of the Office of Federal Procurement Policy Act, as amended (41 U.S.C. 423), as implemented in section 3.104 of the Federal Acquisition Regulation. In the case of a contract modification, the fee subject to reduction is the fee specified in the particular contract modification at the time of execution, except as provided in subparagraph (b)(5) of this clause.

(b) The price or fee reduction referred to in paragraph (a) of this clause shall be--

(1) For cost-plus-fixed-fee contracts, the amount of the fee specified in the contract at the time of award;

(2) For cost-plus-incentive-fee contracts, the target fee specified in the contract at the time of award, notwithstanding any minimum fee or “fee floor” specified in the contract;

(3) For cost-plus-award-fee contracts--

(i) For base fee established in the contract at the time of contract award;

(ii) If no base fee is specified in the contract, 30 percent of the amount of each award fee otherwise payable to the Contractor for each award fee evaluation period or at each award fee determination point.

(4) For fixed-price-incentive contracts, the Government may--

(i) Reduce the contract target price and contract target profit both by an amount equal to the initial target profit specified in the contract at the time of contract award; or

(ii) If an immediate adjustment to the contract target price and contract target profit would have a significant adverse impact on the incentive price revision relationship under the contract, or adversely affect the contract financing provisions, the Contracting Officer may defer such adjustment until establishment of the total final price of the contract.

The total final price established in accordance with the incentive price revision provisions of the contract shall be reduced by an amount equal to the initial target profit specified in the contract at the time of contract award and such reduced price shall be the total final contract price.

(5) For firm-fixed price contracts, by 10 percent of the initial contract price or a profit amount determined by the Contracting Officer from records or documents in existence prior to the date of the contract award.

(c) The Government may, at its election, reduce a prime contractor's price or fee in accordance with the procedures of paragraph (b) of this clause for violations of the Act by its subcontractors by an amount not to exceed the amount of profit or fee reflected in the subcontract at the time the subcontract was first definitively priced.

(d) In addition to the remedies in paragraphs (a) and (c) of this clause, the Government may terminate this contract for default. The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

8. LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JUN 1997) FAR 52.203-12

(a) *Definitions.*

"Agency," as used in this clause, means executive agency as defined in 2.101.

"Covered Federal action," as used in this clause, means any of the following Federal actions:

(1) The awarding of any Federal contract.

(2) The making of any Federal grant.

(3) The making of any Federal loan.

(4) The entering into of any cooperative agreement.

(5) The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

"Indian tribe" and "tribal organization," as used in this clause, have the meaning provided in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) and include Alaskan Natives.

"Influencing or attempting to influence," as used in this clause, means making, with the intent to influence, any communication to or appearance before an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any covered Federal action.

"Local government," as used in this clause, means a unit of government in a State and, if chartered, established, or otherwise recognized by a State for the performance of a governmental duty, including a local public authority, a special district, an intrastate district, a council of governments, a sponsor group representative organization, and any other instrumentality of a local government.

"Officer or employee of an agency," as used in this clause, includes the following individuals who are employed by an agency:

(1) An individual who is appointed to a position in the Government under title 5, United States Code, including a position under a temporary appointment.

(2) A member of the uniformed services, as defined in subsection 101(3), title 37, United States Code.

(3) A special Government employee, as defined in section 202, title 18, United States Code.

(4) An individual who is a member of a Federal advisory committee, as defined by the Federal advisory Committee Act, title 5, United States Code, appendix 2.

"Person," as used in this clause, means an individual, corporation, company, association, authority, firm, partnership, society, State, and local government, regardless of whether such entity is operated for profit, or not for profit. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Reasonable compensation," as used in this clause, means, with respect to a regularly employed officer or employee of any person, compensation that is consistent with the normal compensation for such officer or employee for work that is not furnished to, not funded by, or not furnished in cooperation with the Federal Government.

"Reasonable payment," as used in this clause, means, with respect to professional and other technical services, a payment in an amount that is consistent with the amount normally paid for such services in the private sector.

"Recipient," as used in this clause, includes the Contractor and all subcontractors. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Regularly employed," as used in this clause, means, with respect to an officer or employee of a person requesting or receiving a Federal contract, an officer or employee who is employed by such person for at least 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person for receipt of such contract. An officer or employee who is employed by such person for less than 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person shall be considered to be regularly employed as soon as he or she is employed by such person for 130 working days.

"State," as used in this clause, means a State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, a territory or possession of the United States, an agency or instrumentality of a State, and multi-State, regional, or interstate entity having governmental duties and powers.

(b) *Prohibitions*.

(1) Section 1352 of title 31, United States Code, among other things, prohibits a recipient of a Federal contract, grant, loan, or cooperative agreement from using appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan or cooperative agreement.

(2) The Act also requires Contractors to furnish a disclosure if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

(3) The prohibitions of the Act do not apply under the following conditions:

(i) *Agency and legislative liaison by own employees*.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action if the payment is for agency and legislative liaison activities not directly related to a covered Federal action.

(B) For purposes of subdivision (b)(3)(i)(A) of this clause, providing any information specifically requested by an agency or Congress is permitted at any time.

(C) The following agency and legislative liaison activities are permitted at any time where they are not related to a specific solicitation for any covered Federal action:

(1) Discussing with an agency the qualities and characteristics (including individual demonstrations) of the person's products or services, conditions or terms of sale, and service capabilities.

(2) Technical discussions and other activities regarding the application or adaptation of the person's products or services for an agency's use.

(D) The following agency and legislative liaison activities are permitted where they are prior to formal solicitation of any covered Federal action--

(1) Providing any information not specifically requested but necessary for an agency to make an informed decision about initiation of a covered Federal action;

(2) Technical discussions regarding the preparation of an unsolicited proposal prior to its official submission; and

(3) Capability presentations by persons seeking awards from an agency pursuant to the provisions of the Small Business Act, as amended by Pub. L. 95-507, and subsequent amendments.

(E) Only those services expressly authorized by subdivision (b)(3)(i)(A) of this clause are permitted under this clause.

(ii) *Professional and technical services*.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of--

(1) A payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action, if payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal

action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action.

(2) Any reasonable payment to a person, other than an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action if the payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action. Persons other than officers or employees of a person requesting or receiving a covered Federal action include consultants and trade associations.

(B) For purposes of subdivision (b)(3)(ii)(A) of this clause, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable. Similarly, technical advice provided by an engineer on the performance of operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as a licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this section unless they provide advice and analysis directly applying their professional or technical expertise and unless the advice or analysis is rendered directly and solely in the preparation, submission or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provide legal advice or analysis directly and solely related to the legal aspects of this or her client's proposal, but generally advocate one proposal over another are not allowable under this section because the lawyer is not providing professional legal services. Similarly, communications with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this section since the engineer is providing technical services but not directly in the preparation, submission or negotiation of a covered Federal action.

(C) Requirements imposed by or pursuant to law as a condition for receiving a covered Federal award include those required by law or regulation and any other requirements in the actual award documents.

(D) Only those services expressly authorized by subdivisions (b)(3)(ii)(A)(1) and (2) of this clause are permitted under this clause.

(E) The reporting requirements of FAR 3.803(a) shall not apply with respect to payments of reasonable compensation made to regularly employed officers or employees of a person.

(c) *Disclosure*.

(1) The Contractor who requests or receives from an agency a Federal contract shall file with that agency a disclosure form, OMB standard form LLL, Disclosure of Lobbying Activities, if such person has made or has agreed to make any payment using nonappropriated funds (to include profits from any covered Federal action), which would be prohibited under subparagraph (b)(1) of this clause, if paid for with appropriated funds.

(2) The Contractor shall file a disclosure form at the end of each calendar quarter in which there occurs any event that materially affects the accuracy of the information contained in any disclosure form previously filed by such person under subparagraph (c)(1) of this clause. An event that materially affects the accuracy of the information reported includes--

(i) A cumulative increase of $25,000 or more in the amount paid or expected to be paid for influencing are attempting to influence a covered Federal action; or

(ii) A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or

(iii) A change in the officer(s), employee(s), or Member(s) contacted to influence or attempting to influence a covered Federal action.

(3) The Contractor shall require the submittal of a certification, and if required, a disclosure form by any person who requests or receives any subcontract exceeding $100,000 under the Federal contract.

(4) All subcontractor disclosure forms (but not certifications) shall be forwarded from tier to tier until received by the prime Contractor. The prime Contractor shall submit all disclosures to the Contracting Officer at the end of the

calendar quarter in which the disclosure form is submitted by the subcontractor. Each subcontractor certification shall be retained in the subcontract file of the awarding Contractor.

(d) *Agreement*. The Contractor agrees not to make any payment prohibited by this clause.

(e) *Penalties*.

(1) Any person who makes an expenditure prohibited under paragraph (a) of this clause or who fails to file or amend the disclosure form to be filed or amended by paragraph (b) of this clause shall be subject to civil penalties as provided for by 31 U.S.C. 1352. An imposition of a civil penalty does not prevent the Government from seeking any other remedy that may be applicable.

(2) Contractors may rely without liability on the representation made by their subcontractors in the certification and disclosure form.

(f) *Cost allowability*. Nothing in this clause makes allowable or reasonable any costs which would otherwise be unallowable or unreasonable. Conversely, costs made specifically unallowable by the requirements in this clause will not be made allowable under any other provision.

(End of clause)

9. SPECIAL PROHIBITION ON EMPLOYMENT (NOV 1995) DFARS 252.203-7001

(a) *Definitions*. As used in this clause--

(1) "Arising out of a contract with the DoD" means any act in connection with--

(i) Attempting to obtain,

(ii) Obtaining, or

(iii) Performing a contract or first-tier subcontract of any agency, department, or component of the Department of Defense (DoD).

(2) "Conviction of fraud or any other felony" means any conviction for fraud or a felony in violation of state or Federal criminal statutes, whether entered on a verdict or plea, including a plea of *nolo contendere*, for which sentence has been imposed.

(3) "Date of conviction" means the date judgment was entered against the individual.

(b) 10 U.S.C. 2408 provides that any individual who is convicted after September 29, 1988, of fraud or any other felony arising out of a contract with the DoD is prohibited from:

(1) Working in a management or supervisory capacity on any DoD contract or first-tier subcontract;

(2) Serving on the board of directors of any DoD contractor or fist-tier subcontractor; or

(3) Serving as a consultant to any DoD contractor or first-tier subcontractor.

(c) Unless waived, the prohibition in paragraph (b) applies for five years from the date of conviction.

(d) 10 U.S.C. 2408 further provides that a defense contractor or first-tier subcontractor shall be subject to a criminal penalty of not more than $500,000 if convicted of knowingly--

(1) Employing a person under a prohibition specified in paragraph (b) of this clause; or

(2) Allowing such a person to serve on the board of directors of the contractor or first-tier subcontractor.

(c) In addition to the criminal penalties contained in 10 U.S.C. 2408, the Government may consider other available remedies, such as--

(1) Suspension or debarment;

(2) Cancellation of the contract at no cost to the Government; or

(3) Termination of the contract for default.

(f) The Contractor may submit written requests for waiver of the prohibitions in paragraph (b) of this clause to the Contracting Officer. Requests shall clearly identify--

(1) The person involved;

(2) The nature of the conviction and resultant sentence or punishment imposed;

(3) The reasons for the requested waiver, and

(4) An explanation of why a waiver is in the interest of national security.

(g) The Contractor agrees to include the substance of this clause, appropriately modified to reflect the identify and relationship of the parties, in all first-tier subcontracts exceeding the simplified acquisition threshold in part 13 of the Federal Acquisition Regulation, except those for commercial items or components.

(h) Pursuant to 10 U.S.C. 2408(c), defense contractors and subcontractors may obtain information as to whether a particular person has been convicted of fraud or any other felony arising out of a contract with the DoD by contacting The Office of Justice Programs, The Denial of Benefits Office, U.S. Department of Justice, telephone (202) 307-1065.

(End of clause)

10. DISPLAY OF DOD HOTLINE POSTER (DEC 1991) DFARS 252.203-7002

(a) The Contractor shall display prominently in common work areas within business segments performing work under Department of Defense (DoD) contracts, DoD Hotline Posters prepared by the DoD Office of the Inspector General.

(b) DoD Hotline Posters may be obtained from the DoD Inspector General, ATTN: Defense Hotline, 400 Army Navy Drive, Washington, DC 22202-2884.

(c) The Contractor need not comply with paragraph (a) of this clause if it has established a mechanism, such as a hotline, by which employees may report suspected instances of improper conduct, and instructions that encourage employees to make such reports.

(End of clause)

11. PRINTING/COPYING DOUBLE-SIDED ON RECYCLED PAPER (JUN 1996) FAR 52.204-4

(a) In accordance with Executive Order 12873, dated October 20, 1993, as amended by Executive Order 12995, dated March 25, 1996, the Offeror/Contractor is encouraged to submit paper documents, such as offers, letters, or reports, that are printed/copied double-sided on recycled paper that has at least 20 percent postconsumer material.

(b) The 20 percent standard applies to high-speed copier paper offset paper, forms bond, computer printout paper, carbonless paper, file folders, white woven envelopes, and other uncoated printed and writing paper such as writing and office paper, book paper, cotton fiber paper, and cover stock. An alternative to meeting the 20 percent postconsumer material standards is 50 percent recovered material content of certain industrial by-products.

(End of clause)

12. PROVISION OF INFORMATION TO COOPERATIVE AGREEMENT HOLDERS (DEC 1991) DFARS 252.205-7000

(a) *Definition*.

"Cooperative agreement holder" means a State or local government; a private, nonprofit organization; a tribal organization (as defined in section 4(c) of the Indian Self-Determination and Education Assistance Act (Pub. L. 93-268; 25 U.S.C. 450(c)); or an economic enterprise (as defined in section 3(e) of the Indian Financing Act of 1974 (Pub. L. 93-362; 25 U.S.C. 1452(e)) whether such economic enterprise is organized for profit or nonprofit purposes; which has an agreement with the Defense Logistics Agency to furnish procurement technical assistance to business entities.

(b) The Contractor shall provide cooperative agreement holders, upon their request, with a list of those appropriate employees or offices responsible for entering into subcontracts under defense contracts. The list shall include the business address, telephone number, and area of responsibility of each employee or office.

(c) The Contractor need not provide the listing to a particular cooperative agreement holder more frequently than once a year.

(End of clause)

13. PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (JUL 1995) FAR 52.209-6

(a) The Government suspends or debars Contractors to protect the Government's interests. The Contractor shall not enter into any subcontract in excess of $25,000 with a Contractor that is debarred, suspended, or proposed for debarment unless there is a compelling reason to do so.

(b) The Contractor shall require each proposed first-tier subcontractor, whose subcontract will exceed $25,000, to disclose to the Contractor, in writing, whether as of the time of award of the subcontract, the subcontractor, or its principals, is or is not debarred, suspended, or proposed for debarment by the Federal Government.

(c) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is debarred, suspended, or proposed for debarment (see FAR 9.404 for information on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs). The notice must include the following:

(1) The name of the subcontractor.

(2) The Contractor's knowledge of the reasons for the subcontractor being on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

(3) The compelling reasons(s) for doing business with the subcontractor notwithstanding its inclusion on the List of Parties Excluded From Federal Procurement and Nonprocurement Programs.

(4) The systems and procedures the Contractor has established to ensure that it is fully protecting the Government's interest when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

(End of clause)

14. DEFENSE PRIORITY AND ALLOCATION REQUIREMENTS (SEP 1990) FAR 52.211-15

NOTE: This clause applies only to military contracts.

This is a rated order certified for national defense use, and the contractor shall follow all the requirements of the Defense Priorities and Allocations System regulation (15 CFR 700).

(End of clause)

15. VARIATION IN ESTIMATED QUANTITY (APR 1984) FAR 52.211-18

If the quantity of a unit-priced item in this contract is an estimated quantity and the actual quantity of the unit-priced item varies more than 15 percent above or below the estimated quantity, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above 115 percent or below 85 percent of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contractor may request, in writing, an extension of time, to be received by the Contracting Officer within 10 days from the beginning of the delay, or within such further period as may be granted by the Contracting Officer before the date of final settlement of the contract. Upon the receipt of a written request for an extension, the Contracting Officer shall ascertain the facts and make an adjustment for extending the completion date as, in the judgment of the Contracting Officer, is justified.

(End of clause)

16. AUDIT AND RECORDS--SEALED BIDDING (OCT 1997) FAR 52.214-26

NOTE: This clause applies only to sealed bid contracts.

(a) As used in this clause, "records" includes books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form.

(b) *Cost or pricing data*. If the Contractor has been required to submit cost or pricing data in connection with the pricing of any modification to this contract, the Contracting Officer, or an authorized representative of the Contracting Officer, in order to evaluate the accuracy, completeness, and currency of the cost or pricing data, shall have the right to examine and audit all of the Contractor's records, including computations and projections, related to--

(1) The proposal for the modification;

(2) The discussions conducted on the proposal(s), including those related to negotiating;

(3) Pricing of the modification; or

(4) Performance of the modification.

(c) *Comptroller General*. In the case of pricing any modification, the Comptroller General of the United States, or an authorized representative, shall have the same rights as specified in paragraph (b) of this clause.

(d) *Availability*. The Contractor shall make available at its office at all reasonable times the materials described in paragraph (b) of this clause, for examination, audit, or reproduction, until 3 years after final payment under this contract, or for any other period specified in Subpart 4.7 of the Federal Acquisition Regulation (FAR). FAR Subpart 4.7, Contractor

Records Retention, in effect on the date of this contract, is incorporated by reference in its entirety and made a part of this contract.

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement.

(2) Records pertaining to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to the performance of this contract shall be made available until disposition of such appeals, litigation, or claims.

(e) The Contractor shall insert a clause containing all the provisions of this clause, including this paragraph (e), in all subcontracts expected to exceed the threshold in FAR 15.403-4(a)(1) for submission of cost or pricing data.

(End of clause)

17. PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA--MODIFICATIONS--SEALED BIDDING (OCT 1997) FAR 52.214-27

NOTE: This clause applies only to sealed bid contracts

(a) This clause shall become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for the submission of cost or pricing data at FAR 15.403-4(a)(1), except that this clause does not apply to a modification if an exception under FAR 15.403-1(b) applies.

(b) If any price, including profit, negotiated in connection with any modification under this clause, was increased by any significant amount because (1) the Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data, (2) a subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data, or (3) any of these parties furnished data of any description that were not accurate, the price shall be reduced accordingly and the contract shall be modified to reflect the reduction. This right to a price reduction is limited to that resulting from defects in data relating to modifications for which this clause becomes operative under paragraph (a) of this clause.

(c) Any reduction in the contract price under paragraph (b) of this clause due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which (1) the actual subcontract or (2) the actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; provided, that the actual subcontract price was not itself affected by defective cost or pricing data.

(d)(1) If the Contracting Officer determines under paragraph (b) of this clause that a price or cost reduction should be made, the Contractor agrees not to raise the following matters as a defense:

(i) The Contractor or subcontractor was a sole source supplier or otherwise was in a superior bargaining position and thus the price of the contract would not have been modified even if accurate, complete, and current cost or pricing data had been submitted.

(ii) The Contracting Officer should have known that the cost or pricing data in issue were defective even though the Contractor or subcontractor took no affirmative action to bring the character of the data to the attention of the Contracting Officer.

(iii) The contract was based on an agreement about the total cost of the contract and there was no agreement about the cost of each item procured under the contract.

(iv) The Contractor or subcontractor did not submit a Certificate of Current Cost or Pricing Data.

(2)(i) Except as prohibited by subdivision (d)(2)(ii) of this clause, an offset in an amount determined appropriate by the Contracting Officer based upon the facts shall be allowed against the amount of a contract price reduction if--

(A) The Contractor certifies to the Contracting Officer that, to the best of the Contractor's knowledge and belief, the Contractor is entitled to the offset in the amount requested; and

(B) The Contractor proves that the cost or pricing data were available before the date of agreement on the price of the contract (or price of the modification) and that the data were not submitted before such date.

(ii) An offset shall not be allowed if--

(A) The understated data was known by the Contractor to be understated when the Certificate of Current Cost or Pricing Data was signed; or

(B) The Government proves that the facts demonstrate that the contract price would not have increased in the amount to be offset even if the available data has been submitted before the date of agreement on price.

(e) If any reduction in the contract price under this clause reduces the price of items for which payment was made prior to the date of the modification reflecting the price reduction, the Contractor shall be liable to and shall pay the United States at the time such overpayment is repaid--

(1) Simple interest on the amount of such overpayment to be computed from the date(s) of overpayment to the Contractor to the date the Government is repaid by the Contractor at the applicable underpayment rate effective for each quarter prescribed by the Secretary of the Treasury under 26 U.S.C. 6621 (a)(2); and

(2) A penalty equal to the amount of the overpayment, if the Contractor or subcontractor knowingly submitted cost or pricing data which were incomplete, inaccurate, or noncurrent.

(End of clause)

18. SUBCONTRACTOR COST OR PRICING DATA--MODIFICATIONS-SEALED BIDDING (OCT 1997) FAR 52.214-28

NOTE: This clause applies only to sealed bid contracts.

(a) The requirements of paragraphs (b) and (c) of this clause shall (1) become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1), and (2) be limited to such modifications.

(b) Before awarding any subcontract expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1), on the date of agreement on price or the date of award, whichever is later; or before pricing any subcontract modifications involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1), the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specified identification in writing), unless an exception under FAR 15.403-1(b) applies.

(c) The Contractor shall require the subcontractor to certify in substantially the form prescribed in subsection FAR 15.406-2 that, to the best of its knowledge and belief, the data submitted under paragraph (b) of this clause were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

(d) The Contractor shall insert the substance of this clause, including this paragraph (d), in each subcontract that, when entered into, exceeds the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1).

(End of clause)

19. AUDIT AND RECORDS--NEGOTIATION (AUG 1996) FAR 52.215-2

NOTE: This clause applies only to negotiated contracts.

(a) As used in this clause, “records” includes books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form.

(b) *Examination of costs*. If this is a cost-reimbursement, incentive, time-and-materials, labor-hour, or price redeterminable contract, or any combination of these, the Contractor shall maintain and the Contracting Officer, or an authorized representative of the Contracting Officer, shall have the right to examine and audit all records and other evidence sufficient to reflect properly all costs claimed to have been incurred or anticipated to be incurred directly or indirectly in performance of this contract. This right of examination shall include inspection at all reasonable times of the Contractor’s plants, or parts of them, engaged in performing the contract.

(c) *Cost or pricing data*. If the Contractor has been required to submit cost or pricing data in connection with any pricing action relating to this contract, the Contracting Officer, or an authorized representative of the Contracting Officer, in order to evaluate the accuracy, completeness, and currency of the cost or pricing data, shall have the right to examine and audit all of the Contractor’s records, including computations and projections, related to--

(1) The proposal for the contract, subcontract, or modification;
(2) The discussions conducted on the proposal(s), including those related to negotiating;
(3) Pricing of the contract, subcontract, or modification; or
(4) Performance of the contract, subcontract or modification.

(d) *Comptroller General*.--(1) The Comptroller General of the United States, or an authorized representative, shall have access to and the right to examine any of the Contractor's directly pertinent records involving transactions related to this contract or a subcontract hereunder.

(2) This paragraph may not be construed to require the Contractor or subcontractor to create or maintain any record that the Contractor or subcontractor does not maintain in the ordinary course of business or pursuant to a provision of law.

(e) *Reports*. If the Contractor is required to furnish cost, funding, or performance reports, the Contracting Officer or an authorized representative of the Contracting Officer shall have the right to examine and audit the supporting records and materials, for the purpose of evaluating (1) the effectiveness of the Contractor's policies and procedures to produce data compatible with the objectives of these reports and (2) the data reported.

(f) *Availability*. The Contractor shall make available at its office at all reasonable times the records, materials, and other evidence described in paragraphs (a), (b), (c), (d), and (e) of this clause, for examination, audit, or reproduction, until 3 years after final payment under this contract, or for any shorter period specified in Subpart 4.7, Contractor Records Retention, of the Federal Acquisition Regulation (FAR), or for any longer period required by statute or by other clauses of this contract. In addition--

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement; and

(2) Records relating to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to this contract shall be made available until such appeals, litigation, or claims are finally resolved.

(g) The Contractor shall insert a clause containing all the terms of this clause, including this paragraph (g), in all subcontracts under this contract that exceed the simplified acquisition threshold, and--

(1) That are cost-reimbursement, incentive, time-and-materials, labor-hour, or price-redeterminable type or any combination of these;

(2) For which cost or pricing data are required; or

(3) That require the subcontractor to furnish reports as discussed in paragraph (c) of this clause.

The clause may be altered only as necessary to identify properly the contracting parties and the Contracting Officer under the Government prime contract.

(End of clause)

20. PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA (OCT 1997)
FAR 52.215-10

NOTE: This clause applies only to negotiated contracts.

(a) If any price, including profit or fee, negotiated in connection with this contract, or any cost reimbursable under this contract, was increased by any significant amount because --(1) The Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data; (2) A subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data, or (3) Any of these parties furnished data of any description that were not accurate, the price or cost shall be reduced accordingly and the contract shall be modified to reflect the reduction.

(b) Any reduction in the contract price under paragraph (a) of this clause due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which (1) The actual subcontract; or (2) The actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; provided, that the actual subcontract price was not itself affected by defective cost or pricing data.

(c)(1) If the Contracting Officer determines under paragraph (a) of this clause that a price or cost reduction should be made, the Contractor agrees not to raise the following matters as a defense:

(i) The Contractor or subcontractor was a sole source supplier or otherwise was in a superior bargaining position and thus the price of the contract would not have been modified even if accurate, complete, and current cost or pricing data had been submitted.

(ii) The Contracting Officer should have known that the cost or pricing data in issue were defective even though the Contractor or subcontractor took no affirmative action to bring the character of the data to the attention of the Contracting Officer.

(iii) The contract was based on an agreement about the total cost of the contract and there was no agreement about the cost of each item procured under the contract.

(iv) The Contractor or subcontractor did not submit a Certificate of Current Cost or Pricing Data.

(2)(i) Except as prohibited by subdivision (c)(2)(ii) of this clause, an offset in an amount determined appropriate by the Contracting Officer based upon the facts shall be allowed against the amount of a contract price reduction if--

(A) The Contractor certifies to the Contracting Officer that, to the best of the Contractor's knowledge and belief, the Contractor is entitled to the offset in the amount requested; and

(B) The Contractor proves that the cost or pricing data were available before the "as of" date specified on its Certificate of Current Cost or Pricing Data, and that the data were not submitted before such date

(ii) An offset shall not be allowed if--

(A) The understated data was known by the Contractor to be understated before the "as of" date specified on its Certificate of Current Cost or Pricing Data; or

(B) The Government proves that the facts demonstrate that the contract price would not have increased in the amount to be offset even if the available data has been submitted before the "as of" date specified on its Certificate of Current Cost or Pricing Data.

(d) If any reduction in the contract price under this clause reduces the price of items for which payment was made prior to the date of the modification reflecting the price reduction, the Contractor shall be liable to and shall pay the United States at the time such overpayment is repaid--

(1) Simple interest on the amount of such overpayment to be computed from the date(s) of overpayment to the Contractor to the date the Government is repaid by the Contractor at the applicable under payment rate effective for each quarter prescribed by the Secretary of the Treasury under 26 U.S.C. 6621(a)(2); and

(2) A penalty equal to the amount of the overpayment, if the Contractor or subcontractor knowingly submitted cost or pricing data which were incomplete, inaccurate, or noncurrent.

(End of clause)

21. SUBCONTRACTOR COST OR PRICING DATA (OCT 1997) FAR 52.215-12

NOTE: This clause applies only to negotiated contracts.

(a) Before awarding any subcontract expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4, on the date of agreement on price or the date of award, whichever is later; or before pricing any subcontract modification involving a pricing adjustment expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4, the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless an exception under FAR 15.403-1 applies.

(b) The Contractor shall require the subcontractor to certify in substantially the form prescribed in subsection 15.406-2 that, to the best of its knowledge and belief, the data submitted under paragraph (a) of this clause were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

(c) In each subcontract that exceeds the threshold for submission of cost or pricing data at FAR 15.403-4, when entered into, the Contractor shall insert either--

(1) The substance of this clause, including this paragraph (c), if paragraph (a) of this clause requires submission of cost or pricing data for the subcontract; or

(2) The substance of the clause at FAR 52.215-13, Subcontractor Cost or Pricing Data--Modifications.

(End of clause)

22. TERMINATION OF DEFINED BENEFIT PENSION PLANS (OCT 1997) FAR 52.215-15

NOTE: This clause applies only to negotiated contracts.

The Contractor shall promptly notify the Contracting Officer in writing when it determines that it will terminate a defined benefit pension plan or otherwise recapture such pension fund assets. If pension fund assets revert to the Contractor or are constructively received by it under a termination or otherwise, the Contractor shall make a refund or give a credit to the Government for its equitable share as required by FAR 31.205-6(j)(4). The Contractor shall include the substance of this clause in all subcontracts under this contract which meet the applicability requirements of FAR 15.408(g).

(End of clause)

23. REVERSION OR ADJUSTMENT OF PLANS FOR POSTRETIREMENT BENEFITS

(PRB) OTHER THAN PENSIONS (OCT 1997) FAR 52.215-18

NOTE: This clause applies only to negotiated contracts.

The Contractor shall promptly notify the Contracting Officer in writing when it determines that it will terminate or reduce a PRB plan. If PRB fund assets revert, or inure, to the Contractor or are constructively received by it under a plan termination or otherwise, the Contractor shall make a refund or give a credit to the Government for its equitable share as required by FAR 31.205-6(o)(6). The Contractor shall include the substance of this clause in all subcontracts under this contract which meet the applicability requirements of FAR 15.408(j)

(End of clause)

24. NOTIFICATION OF OWNERSHIP CHANGES (OCT 1997) FAR 52.215-19

NOTE: This clause applies only to negotiated contracts.

(a) The Contractor shall make the following notifications in writing:

(1) When the Contractor becomes aware that a change in its ownership has occurred, or is certain to occur, which could result in changes in the valuation of its capitalized assets in the accounting records, the Contractor shall notify the Administrative Contracting Officer (ACO) within 30 days.

(2) The Contractor shall also notify the ACO within 30 days whenever changes to asset valuations or any other cost changes have occurred or are certain to occur as a result of a change in ownership.

(b) The Contractor shall-- (1) Maintain current, accurate, and complete inventory records of assets and their costs; (2) Provide the ACO or designated representative ready access to the records upon request; (3) Ensure that all individual and grouped assets, their capitalized values, accumulated depreciation or amortization, and remaining useful lives are identified accurately before and after each of the Contractor's ownership changes; and (4) Retain and continue to maintain depreciation and amortization schedules based on the asset records maintained before each Contractor ownership change.

(c) The Contractor shall include the substance of this clause in all subcontracts under this contract which meet the applicability requirement of FAR 15.408(k).

(End of clause)

25. PRICING ADJUSTMENTS (DEC 1991) DFARS 252.215-7000

NOTE: This clause applies only to negotiated contracts.

The term "pricing adjustment," as used in paragraph (a) of the clauses entitled "Price Reduction for Defective Cost or Pricing Data - Modifications," "Subcontractor Cost or Pricing Data," and "Subcontractor Cost or Pricing Data - Modifications," means the aggregate increases and/or decreases in cost plus applicable profits.

(End of clause)

26. UTILIZATION OF SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS CONCERNS (JUN 1997) FAR 52.219-8

(a) It is the policy of the United States that small business concerns, small business concerns owned and controlled by socially and economically disadvantaged individuals and small business concerns owned and controlled by women shall have the maximum practicable opportunity to participate in performing contracts let by any Federal agency, including contracts and subcontracts for subsystems, assemblies, components, and related services for major systems. It is further the policy of the United States that its prime contractors establish procedures to ensure the timely payment of amounts due pursuant to the terms of their subcontracts with small business concerns, small business concerns owned and controlled by socially and economically disadvantaged individuals and small business concerns owned and controlled by women.

(b) The Contractor hereby agrees to carry out this policy in the awarding of subcontracts to the fullest extent consistent with efficient contract performance. The Contractor further agrees to cooperate in any studies or surveys as may be conducted by the United States Small Business Administration or the awarding agency of the United States as may be necessary to determine the extent of the Contractor's compliance with this clause.

(c) As used in this contract, the term "small business concern" shall mean a small business as defined pursuant to section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto. The term "small business concern owned and controlled by socially and economically disadvantaged individuals" shall mean a small business concern (1) which is at least 51 percent unconditionally owned by one or more socially and economically disadvantaged

individuals; or, in the case of any publicly owned business, at least 51 per centum of the stock of which is unconditionally owned by one or more socially and economically disadvantaged individuals; and (2) whose management and daily business operations are controlled by one or more of such individuals. This term also means a small business concern that is at least 51 percent unconditionally owned by an economically disadvantaged Indian tribe or Native Hawaiian Organization, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one of these entities which has its management and daily business controlled by members of an economically disadvantaged Indian tribe or Native Hawaiian Organization, and which meets the requirements of 13 CFR 124. The Contractor shall presume that socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Subcontinent Asian Americans, and other minorities, or any other individual found to be disadvantaged by the Administration pursuant to section 8(a) of the Small Business Act. The Contractor shall presume that socially and economically disadvantaged entities also include Indian Tribes and Native Hawaiian Organizations.

(d) The term "small business concern owned and controlled by women" shall mean a small business concern (1) which is at least 51 percent owned by one or more women, or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women, and (2) whose management and daily business operations are controlled by one or more women; and

(e) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as a small business concern, a small business concern owned and controlled by socially and economically disadvantaged individuals or a small business concern owned and controlled by women.

(End of clause)

27. SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (AUG 1996) FAR 52.219-9

NOTE: This clause applies to negotiated solicitations over $1,000,000.00. See also FAR 52.219-9 II below

(a) This clause does not apply to small business concerns.

(b) "Commercial product," as used in this clause, means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product.

"Subcontract," as used in this clause, means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) The offeror, upon request by the Contracting Officer, shall submit and negotiate a subcontracting plan, where applicable, which separately addresses subcontracting with small business concerns, with small disadvantaged business concerns and with women-owned small business concerns. If the offeror is submitting an individual contract plan, the plan must separately address subcontracting with small business concerns, small disadvantaged business concerns, and women-owned small business concerns with a separate part for the basic contract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant contract. The subcontracting plan shall be negotiated within the time specified by the Contracting Officer. Failure to submit and negotiate the subcontracting plan shall make the offeror ineligible for award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns, small disadvantaged business concerns and women-owned small business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted;

(ii) Total dollars planned to be subcontracted to small business concerns;

(iii) Total dollars planned to be subcontracted to small disadvantaged business concerns; and

(iv) Total dollars planned to be subcontracted to women-owned small business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to (i) small business concerns, (ii) small disadvantaged business concerns and (iii) women-owned small business concerns.

(4) A description of the method used to develop the subcontracting goals in paragraph (d)(1) of this clause.

(5) A description of the methods used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small, small disadvantaged and women-owned small business concerns trade associations). A firm may rely on the information contained in PASS as an accurate representation of a concern's size and ownership characteristics for purposes of maintaining a small business source list. A firm may rely on PASS as its small business source list. Use of the PASS as its source list does not relieve a firm of its responsibilities (e.g., outreach, assistance, counseling, publicizing subcontracting opportunities) in this clause.

(6) A statement as to whether or not the offeror included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns, (ii) small disadvantaged business concerns, and (iii) women-owned small business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small, small disadvantaged and women-owned small business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurance that the offeror will include the clause in this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) who receive subcontracts in excess of $500,000 ($1,000,000 for construction of any public facility) to adopt a plan similar to the plan agreed to by the offeror.

(10) Assurances that the offeror will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, (iii) submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with the instructions on the forms, and (iv) ensure that its subcontractors agree to submit Standard Forms 294 and 295.

(11) A recitation of the types of records the offeror will maintain to demonstrate procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of its efforts to locate small, small disadvantaged and women-owned small business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

(i) Source lists (e.g., PASS), guides, and other data that identify small, small disadvantaged and women-owned small business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small, small disadvantaged or women-owned small business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than $100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, (C) whether women-owned small business concerns were solicited and if not, why not, and (D) if applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small, small disadvantaged and women-owned small business sources.

(v) Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the program's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small, small disadvantaged and women-owned small business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the contractor's lists of potential small, small disadvantaged and women-owned small business subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small, small disadvantaged and women-owned small business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representative of small, small disadvantaged and women-owned small business firms.

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, small disadvantaged or women-owned small business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.

(f) A master subcontracting plan on a plant or division-wide basis which contains all the elements required by (d) above, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided, (1) the master plan has been approved, (2) the offeror ensures that the master plan is updated as necessary and provides copies of the approved master plan, including evidence of its approval, to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contacting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g)(1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the offeror's production generally, for both commercial and non-commercial products, rather than solely to the Government contract. In these cases, the offeror shall, with the concurrence of the Contracting Officer, submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the agency awarding the offeror its first prime contract requiring a subcontracting plan during the fiscal year, or by an agency satisfactory to the Contracting Officer.

(3) The approved plan shall remain in effect during the offeror's fiscal year for all of the offeror's commercial products.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

(End of clause)

28. SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (AUG 1996) ALTERNATE I (OCT 1995) FAR 52.219-9 I

NOTE: This clause applies only to sealed-bid solicitations over $1,000,000.00.

(a) This clause does not apply to small business concerns.

(b) "Commercial product," as used in this clause, means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product.

"Subcontract," as used in this clause, means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) The apparent low bidder, upon request by the Contracting Officer, shall submit a subcontracting plan, where applicable, which separately addresses subcontracting with small business concerns, with small disadvantaged business concerns and with women-owned small business concerns. If the bidder is submitting an individual contract plan, the plan must separately address subcontracting with small business concerns, small disadvantaged business concerns, and women-owned small business concerns, with a separate part for the basic contract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant contract. The subcontracting plan shall be submitted within the time specified by the Contracting Officer. Failure to submit the subcontracting plan shall make the bidder ineligible for the award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns, small disadvantaged business concerns and women-owned small business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted;

(ii) Total dollars planned to be subcontracted to small business concerns;

(iii) Total dollars planned to be subcontracted to small disadvantaged business concerns; and

(iv) Total dollars planned to be subcontracted to women-owned small business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to (i) small business concerns, (ii) small disadvantaged business concerns and (iii) women-owned small business concerns.

(4) A description of the method used to develop the subcontracting goals in paragraph (d)(1) of this clause.

(5) A description of the methods used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research Information Division of the Minority Business Development Agency in the Department of Commerce, or small, small disadvantaged and women-owned small business concerns trade associations). A firm may rely on the information contained in PASS as an accurate representation of a concern's size and ownership characteristics for purposes of maintaining a small business source list. A firm may rely on PASS as its small business source list. Use of the PASS as its source list does not relieve a firm of its responsibilities (e.g., outreach, assistance, counseling, publicizing subcontracting opportunities) in this clause.

(6) A statement as to whether or not the offeror included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns, (ii) small disadvantaged business concerns, and (iii) women-owned small business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small, small disadvantaged and women-owned small business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurance that the offeror will include the clause in this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) who receive subcontracts in excess of $500,000 ($1,000,000 for construction of any public facility) to adopt a plan similar to the plan agreed to by the offeror.

(10) Assurances that the offeror will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, (iii) submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with the instructions on the forms, and (iv) ensure that its subcontractors agree to submit Standard Forms 294 and 295.

(11) A recitation of the types of records the offeror will maintain to demonstrate procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of its efforts to locate small, small disadvantaged and women-owned small business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

(i) Source lists (e.g., PASS), guides, and other data that identify small, small disadvantaged and women-owned small business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small, small disadvantaged or women-owned small business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than $100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, (C) whether women-owned small business concerns were solicited and if not, why not, and (D) if applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small, small disadvantaged and women-owned small business sources.

(v) Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the program's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small, small disadvantaged and women-owned small business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the contractor's lists of potential small, small disadvantaged and women-owned small business subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small, small disadvantaged and women-owned small business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representative of small, small disadvantaged and women-owned small business firms.

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, small disadvantaged or women-owned small business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.

(f) A master subcontracting plan on a plant or division-wide basis which contains all the elements required by (d) above, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided, (1) the master plan has been approved, (2) the offeror ensures that the master plan is updated as necessary and provides copies of the approved master plan, including evidence of its approval, to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contacting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g)(1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the offeror's production generally, for both commercial and non-commercial products, rather than solely to the Government contract. In these cases, the offeror shall, with the concurrence of the Contracting Officer, submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the agency awarding the offeror its first prime contract requiring a subcontracting plan during the fiscal year, or by an agency satisfactory to the Contracting Officer.

(3) The approved plan shall remain in effect during the offeror's fiscal year for all of the offeror's commercial products.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

(End of clause)

29. SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (AUG 1996) ALTERNATE II (MAR 1996) FAR 52.219-9 II

NOTE: This clause applies only to negotiated solicitations over $1,000,000, when a subcontracting plan is required with the initial proposal as described in Sections 00110 & 00115.

(a) This clause does not apply to small business concerns.

(b) "Commercial product," as used in this clause, means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product.

"Subcontract," as used in this clause, means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) Proposals submitted in response to this solicitation shall include a subcontracting plan, which separately addresses subcontracting with small business concerns, small disadvantaged business concerns and women-owned small business concerns. If the offeror is submitting an individual contract plan, the plan must separately address subcontracting with small business concerns, small disadvantaged business concerns and women-owned small business concerns with a separate part for the basic contract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant contract. The subcontracting plan shall be negotiated within the time specified by the Contracting Officer. Failure to submit and negotiate a subcontracting plan shall make the offeror ineligible for award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns, small disadvantaged business concerns and women-owned small business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted;

(ii) Total dollars planned to be subcontracted to small business concerns;

(iii) Total dollars planned to be subcontracted to small disadvantaged business concerns; and

(iv) Total dollars planned to be subcontracted to women-owned small business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to (i) small business concerns, (ii) small disadvantaged business concerns and (iii) women-owned small business concerns.

(4) A description of the method used to develop the subcontracting goals in paragraph (d)(1) of this clause.

(5) A description of the methods used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research Information Division of the Minority Business Development Agency in the Department of Commerce, or small, small disadvantaged and women-owned small business concerns trade associations). A firm may rely on the information contained in PASS as an accurate representation of a concern's size and ownership characteristics for purposes of maintaining a small business source list. A firm may rely on PASS as its small business source list. Use of the PASS as its source list does not relieve a firm of its responsibilities (e.g., outreach, assistance, counseling, publicizing subcontracting opportunities) in this clause.

(6) A statement as to whether or not the offeror included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns, (ii) small disadvantaged business concerns, and (iii) women-owned small business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small, small disadvantaged and women-owned small business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurance that the offeror will include the clause in this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) who receive subcontracts in excess of $500,000 ($1,000,000 for construction of any public facility) to adopt a plan similar to the plan agreed to by the offeror.

(10) Assurances that the offeror will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, (iii) submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with the instructions on the forms, and (iv) ensure that its subcontractors agree to submit Standard Forms 294 and 295.

(11) A recitation of the types of records the offeror will maintain to demonstrate procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of its efforts to locate small, small disadvantaged and women-owned small business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

(i) Source lists (e.g., PASS), guides, and other data that identify small, small disadvantaged and women-owned small business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small, small disadvantaged or women-owned small business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than $100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, (C) whether women-owned small business concerns were solicited and if not, why not, and (D) if applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small, small disadvantaged and women-owned small business sources.

(v) Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the program's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small, small disadvantaged and women-owned small business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by

such concerns. Where the contractor's lists of potential small, small disadvantaged and women-owned small business subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small, small disadvantaged and women-owned small business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representative of small, small disadvantaged and women-owned small business firms.

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, small disadvantaged or women-owned small business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.

(f) A master subcontracting plan on a plant or division-wide basis which contains all the elements required by (d) above, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided, (1) the master plan has been approved, (2) the offeror ensures that the master plan is updated as necessary and provides copies of the approved master plan, including evidence of its approval, to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contacting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g)(1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the offeror's production generally, for both commercial and non-commercial products, rather than solely to the Government contract. In these cases, the offeror shall, with the concurrence of the Contracting Officer, submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the agency awarding the offeror its first prime contract requiring a subcontracting plan during the fiscal year, or by an agency satisfactory to the Contracting Officer.

(3) The approved plan shall remain in effect during the offeror's fiscal year for all of the offeror's commercial products.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

(End of clause)

30. LIMITATIONS ON SUBCONTRACTING (DEC 1996) FAR 52.219-14

NOTE: This clause applies only if the contract, or any portion of the contract is set-aside for small business or set-aside for the 8(a) program.

(a) This clause does not apply to the unrestricted portion of a partial set-aside.

(b) By submission of an offer and execution of a contract, the Offeror/Contractor agrees that in performance of the contract in the case of a contract for--

(1) *Services (except construction)*. At least 50 percent of the cost of contract performance incurred for personnel shall be expended for employees of the concern.

(2) *Supplies (other than procurement from a nonmanufacturer of such supplies)*. The concern shall perform work for at least 50 percent of the cost of manufacturing the supplies, not including the cost of materials.

(3) *General construction*. The concern will perform at least 15 percent of the cost of the contract, not including the cost of materials, with its own employees.

(4) *Construction by special trade contractors*. The concern will perform at least 25 percent of the cost of the contract, not including the cost of materials, with its own employees.

(End of clause)

31. LIQUIDATED DAMAGES--SUBCONTRACTING PLAN (OCT 1995) FAR 52.219-16 (a) "Failure to make a good faith effort to comply with the subcontracting plan", as used in this clause, means a willful or intentional failure to perform in accordance with the requirements of the subcontracting plan approved under the clause in this contract entitled "Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan," or willful or intentional action to frustrate the plan.

(b) If, at contract completion, or in the case of a commercial product plan, at the close of the fiscal year for which the plan is applicable, the Contractor has failed to meet its subcontracting goals and the Contracting Officer decides in

accordance with paragraph (c) of this clause that the Contractor failed to make a good faith effort to comply with its subcontracting plan, established in accordance with the clause in this contract entitled "Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan," the Contractor shall pay the Government liquidated damages in an amount stated. The amount of probable damages attributable to the Contractor's failure to comply, shall be an amount equal to the actual dollar amount by which the Contractor failed to achieve each subcontract goal or, in the case of a commercial products plan, that portion of the dollar amount allocable to Government contracts by which the Contractor failed to achieve each subcontract goal.

(c) Before the Contracting Officer makes a final decision that the Contractor has failed to make such good faith effort, the Contracting Officer shall give the Contractor written notice specifying the failure and permitting the Contractor to demonstrate what good faith efforts have been made. Failure to respond to the notice may be taken as an admission that no valid explanation exists. If, after consideration of all pertinent data, the Contracting Officer finds that the Contractor failed to make a good faith effort to comply with the subcontracting plan, the Contracting Officer shall issue a final decision to that effect and require that the Contractor pay the Government liquidated damages as provided in paragraph (b) of this clause.

(d) With respect to commercial product plans; i.e., company-wide or division-wide subcontracting plans approved under paragraph (g) of the clause in this contract entitled "Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan," the Contracting Officer of the agency that originally approved the plan will exercise the functions of the Contracting Officer under this clause on behalf of all agencies that awarded contracts covered by that commercial product plan.

(e) The Contractor shall have the right of appeal, under the clause in this contract entitled, Disputes, from any final decision of the Contracting Officer.

(f) Liquidated damages shall be in addition to any other remedies that the Government may have.

(End of clause)

32. SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (DoD CONTRACTS) (APR 1996) DFARS 252.219-7003

This clause supplements the Federal Acquisition Regulation 52.219-9, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan, clause of this contract.

(a) *Definitions*.

"Historically black colleges and universities," as used in this clause, means institutions determined by the Secretary of Education to meet the requirements of 34 CFR Section 608.2. The term also means any nonprofit research institution that was an integral part of such a college or university before November 14, 1986.

"Minority institutions," as used in this clause, means institutions meeting the requirement of Section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1135d-5(3)). The term also includes Hispanic-serving institutions as defined in Section 316(b)(1) of such Act (20 U.S.C. 1059c(b)(1)).

(b) Except for company or division-wide commercial items subcontracting plans, the term "small disadvantaged business," when used in the FAR 52.219-9 clause, includes historically black colleges and universities and minority institutions, in addition to small disadvantaged business concerns.

(c) Work under the contract or its subcontracts shall be credited toward meeting the small disadvantaged business concern goal required by paragraph (d) of the FAR 52.219-9 clause when:

(1) It is performed on Indian lands or in joint venture with an Indian tribe or a tribally-owned corporation, and

(2) It meets the requirements of 10 U.S.C. 2323a.

(d) Subcontracts awarded to workshops approved by the Committee for Purchase from People Who are Blind or Severely Disabled (41 U.S.C. 46-48), may be counted toward the Contractor's small business subcontracting goal.

(e) A mentor firm, under the Pilot Mentor-Protégé Program established under Section 831 of Pub. L. 101-510, as amended, may count toward its small disadvantaged business goal, subcontracts awarded--

(1) Protégé firms which are qualified organizations employing the severely handicapped; and

(2) Former protégé firms that meet the criteria in Section 831(g)(4) of Pub. L. 101-510.

(f) The master plan approval referred to in paragraph (f) of the FAR 52.219-9 clause is approval by the Contractor's cognizant contract administration activity.

(g) In those subcontracting plans which specifically identify small, small disadvantaged, and women-owned small businesses, the Contractor shall notify the Administrative Contracting Officer of any substitutions of firms that are not small, small disadvantaged, or women-owned small businesses for the firms listed in the subcontracting plan. Notifications shall be in writing and shall occur within a reasonable period of time after award of the subcontract. Contractor-specified formats shall be acceptable.

(End of clause)

33. NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (FEB 1997) FAR 52.222-1

If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediate give notice, including all relevant information, to the Contracting Officer.

(End of clause)

34 CONVICT LABOR (AUG 1996) FAR 52.222-3

The Contractor agrees not to employ in the performance of this contract any person undergoing a sentence of imprisonment which has been imposed by any court of a State, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, or the Trust Territory of the Pacific Islands. This limitation, however, shall not prohibit the employment by the Contractor in the performance of this contract of persons on parole or probation to work at paid employment during the term of their sentence or persons who have been pardoned or who have served their terms. Nor shall it prohibit the employment by the Contractor in the performance of this contract of persons confined for violation of the laws of any of the States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, or the Trust Territory of the Pacific Islands who are authorized to work at paid employment in the community under the laws of such jurisdiction, if--

(a) (1) The worker is paid or is in an approved work training program on a voluntary basis;

(2) Representatives of local union central bodies or similar labor union organizations have been consulted;

(3) Such paid employment will not result in the displacement of employed workers, or be applied in skills, crafts, or trades in which there is a surplus of available gainful labor in the locality, or impair existing contracts for services;

(4) The rates of pay and other conditions of employment will not be less than those paid or provided for work of a similar nature in the locality in which the work is being performed; and

(b) The Attorney General of the United States has certified that the work-release laws or regulations of the jurisdiction involved are in conformity with the requirements of Executive Order 11755, as amended by Executive Orders 12608 and 12943.

(End of clause)

35. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT--OVERTIME COMPENSATION (JUL 1995) FAR 52.222-4

(a) *Overtime requirements*. No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics (see Federal Acquisition Regulation (FAR) 22.300) shall require or permit any such laborers or mechanics in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than 1-1/2 times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(b) *Violation; liability for unpaid wages; liquidated damages*. In the event of any violation of the provisions set forth in paragraph (a) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanical employed in violation of the provisions set forth in paragraph (a) of this clause in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in paragraph (a) of this clause.

(c) *Withholding for unpaid wages and liquidated damages*. The Contracting Officer shall upon his or her own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same Prime Contractor, such sums as may be determined to be

necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in paragraph (b) of this clause.

(d) *Payrolls and basic records*. (1) The Contractor or subcontractor shall maintain payrolls and basic payroll records during the course of contract work and shall preserve them for a period of 3 years from the completion of the contract for all laborers and mechanics working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Nothing in this paragraph shall require the duplication of records required to be maintained for construction work by Department of Labor regulations at 29 CFR 5.5(a)(3) implementing the Davis-Bacon Act.

(2) The records to be maintained under paragraph (d)(1) of this clause shall be made available by the Contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Contracting Officer or the Department of Labor. The Contractor or subcontractor shall permit such representatives to interview employees during working hours on the job.

(e) *Subcontracts*. The Contractor or subcontractor shall insert in any subcontracts exceeding $100,000 the provisions set forth in paragraphs (a) through (e) of this clause and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the provisions set forth in paragraphs (a) through (e) of this clause.

(End of clause)

36. DAVIS-BACON ACT (FEB 1995) FAR 52.222-6

(a) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (d) of this clause; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such period. Such laborers and mechanics shall be paid not less than the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in the clause entitled Apprentices and Trainees. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph (b) of this clause) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(b)(1) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Contracting Officer shall approved an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination.

(ii) The classification is utilized in the area by the construction industry.

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator or an authorized representative will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(3) In the event the Contractor, the laborers or mechanics to be employed in the classification, or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs (b)(2) and (b)(3) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(c) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(d) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(End of clause)

37. WITHHOLDING OF FUNDS (FEB 1988) FAR 52.222-7

The Contracting Officer shall, upon his or her own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(End of clause)

38. PAYROLLS AND BASIC RECORDS (FEB 1988) FAR 52.222-8

(a) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under paragraph (d) of the clause entitled Davis-Bacon Act, that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(b)(1) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph (a) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents. U.S. Government Printing Office, Washington, DC 20402. The Prime Contractor is responsible for the submission of copies of payrolls by all subcontractors.

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify--

(i) That the payroll for the payroll period contains the information required to be maintained under paragraph (a) of this clause and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR Part 3; and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph (b)(2) of this clause.

(4) The falsification of any of the certifications in this clause may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(c) The Contractor or subcontractor shall make the records required under paragraph (a) of this clause available for inspection, copying, or transcription by the Contracting Officer or authorized representatives of the Contracting Officer or the Department of Labor. The Contractor or subcontractor shall permit the Contracting Officer or representatives of the Contracting Officer or the Department of Labor to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit required records or to make them available, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(End of clause)

39. APPRENTICES AND TRAINEES (FEB 1988) FAR 52.222-9

(a) *Apprentices*. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rates) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(b) *Trainees*. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and

Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(c) *Equal employment opportunity*. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

(End of clause)

40. COMPLIANCE WITH COPELAND ACT REQUIREMENTS (FEB 1988) FAR 52.222-10

The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

(End of clause)

41. SUBCONTRACTS (LABOR STANDARDS) (FEB 1988) FAR 52.222-11

(a) The Contractor or subcontractor shall insert in any subcontracts the clauses entitled *Davis-Bacon Act, Contract Work Hours and Safety Standards Act--Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Withholding of Funds, Subcontracts (Labor Standards), Contract Termination--Debarment, Disputes Concerning Labor Standards, Compliance with Davis-Bacon and Related Act Regulations, and Certification of Eligibility,* and such other clauses as the Contracting Officer may, by appropriate instructions, require, and also a clause requiring subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all the contract clauses cited in this paragraph.

(b)(1) Within 14 days after award of the contract, the Contractor shall delivery to the Contracting Officer a completed Statement and Acknowledgment Form (SF 1413) for each subcontract, including the subcontractor's signed and dated acknowledgment that the clauses set forth in paragraph (a) of this clause have been included in the subcontract.

(2) Within 14 days after the award of any subsequently awarded subcontract the Contractor shall delivery to the Contracting Officer an updated completed SF 1413 for such additional subcontract.

(End of clause)

42. CONTRACT TERMINATION--DEBARMENT (FEB 1988) FAR 52.222-12

A breach of the contract clauses entitled *Davis-Bacon Act, Contract Work Hours and Safety Standards Act--Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Subcontracts (Labor Standards), Compliance with Davis-Bacon and Related Act Regulations, or Certification of Eligibility*, may be grounds for termination of the contract, and for debarment as a Contractor and subcontractor as provided in 29 CFR 5.12.

(End of clause)

43. COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988) FAR 52.222-13

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are hereby incorporated by reference in this contract.

(End of clause)

44. DISPUTES CONCERNING LABOR STANDARDS (FEB 1988) FAR 52.222-14

The United States Department of Labor has set forth in 29 CFR Parts 5, 6, and 7 procedures for resolving disputes concerning labor standards requirements. Such disputes shall be resolved in accordance with those procedures and not the Disputes clause of this contract. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(End of clause)

45. CERTIFICATION OF ELIGIBILITY (FEB 1988) FAR 52.222-15

(a) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(End of clause)

46. EQUAL OPPORTUNITY (APR 1984) FAR 52.222-26

(a) If, during any 12-month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded nonexempt Federal contracts and/or subcontracts that have an aggregate value in excess of $10,000, the Contractor shall comply with subparagraphs (b)(1) through (11) below. Upon request, the Contractor all provide information necessary to determine the applicability of this clause.

(b) During performing this contract, the Contractor agrees as follows:

(1) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

(2) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (i) employment, (ii) upgrading, (iii) demotion, (iv) transfer, (v) recruitment or recruitment advertising, (vi) layoff or termination, (vii) rates of pay or other forms of compensation, and (viii) selection for training, including apprenticeship.

(3) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(4) The Contractor shall, in all solicitations or advertisement for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(5) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(6) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(7) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of labor. Standard Form 100 (EEO-1), or any successor form, is the prescribed form to be filed within 30 days following the award, unless filed within 12 months preceding the date of award.

(8) The Contractor shall permit access to its books, records, and accounts by the contracting agency or the Office of Federal Contract Compliance Programs (OFCCP) for the purposes of investigation to ascertain the Contractor's compliance with the applicable rules, regulations, and orders.

(9) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

(10) The Contractor shall include the terms and conditions of subparagraph (b)(1) through (11) of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontract or vendor.

(11) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of any direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

(c) Notwithstanding any other clause in this contract, disputes relative to this clause will be governed by the procedures in 41 CFR 60-1.1.

(End of clause)

47. AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (APR 1984) FAR 52.222-27

(a) *Definitions*.

"Covered area," as used in this clause, means the geographical area described in the solicitation for this contract.

"Director," as used in this clause, means Director, Office of Federal Contract Compliance Programs (OFCCP), United States Department of Labor, or any person to whom the Director delegates authority.

"Employer identification number," as used in this clause, means the Federal Social Security number used on the employer's quarterly federal tax return, U.S. Treasury Department For 941.

"Minority," as used in this clause, means--

(1) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

(2) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(3) Black (all persons having origins in any of the black African racial groups not of Hispanic origin);

(4) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);

(b) If the Contractor, or a subcontractor at any tier, subcontracts a portion of the work involving any construction trade, each such subcontract in excess of $10,000 shall include this clause and the Notice containing the goals for minority and female participation stated in the solicitation for this contract.

(c) If the Contractor is participating in a Hometown Plan (41 CFR 60-4) approved by the U.S. Department of Labor in a covered area, either individually or through an association, its affirmative action obligations on all work in the plan area (including goals) shall comply with the plan for those trades that have unions participating in the plan. Contractors must be able to demonstrate participation in, and compliance with, the provisions of the plan. Each Contractor or subcontractor participating in an approved plan is also required to comply with its obligations under the Equal Opportunity clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good-faith performance by other Contractors or subcontractors toward a goal in an approved plan does not excuse any Contractor's or subcontractor's failure to make good-faith efforts to achieve the plan's goals.

(d) The Contractor shall implement the affirmative action procedures in subparagraphs (g)(1) through (16) of this clause. The goals stated in the solicitation for this contract are expressed as percentages of the total hours of employment and training of minority and female utilization that the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where that work is actually performed. The Contractor is expected to make substantially uniform progress toward its goals in each craft.

(e) Neither the terms and conditions of any collective bargaining agreement, nor the failure by a union with which the Contractor has a collective bargaining agreement, to refer minorities or women shall excuse the Contractor's obligations under this clause, Executive Order 11246, as amended, or the regulations thereunder.

(f) In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

(g) The Contractor shall take affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with this clause shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and implement affirmative action steps at least as extensive as the following:

(1) Ensure a working environment free of harassment, intimidation, and coercion at all sites and in all facilities where the Contractor's employees are assigned to work. The Contractor, if possible, will assign two or more women to each construction project. The Contractor shall ensure that foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at these sites or facilities.

(2) Establish and maintain a current list of sources for minority and female recruitment. Provide written notification to minority and female recruitment sources and community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

(3) Establish and maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant, referrals of minorities or females from unions, recruitment sources, or community organizations and the action taken with respect to each individual. If an individual was sent to the union hiring hall for referral and not referred back to the Contractor by the union or, if referred back, not employed by the Contractor, this shall be documented in the file, along with whatever additional actions the Contractor may have taken.

(4) Immediately notify the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred back to the Contractor a minority or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

(5) Develop on-the-job training opportunities and/or participate in training programs for the area that expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under subparagraph (g)(2) above.

(6) Disseminate the Contractor's equal employment policy by--

(i) Providing notice of the policy to unions and to training, recruitment, and outreach programs, and requesting their cooperation in assisting the Contractor in meeting its contract obligations;

(ii) Including the policy in any policy manual and in collective bargaining agreements;

(iii) Publicizing the policy in the company newspaper, annual report, etc.;

(iv) Reviewing the policy with all management personnel and with all minority and female employees at least once a year; and

(v) Posting the policy on bulletin boards accessible to employees at each location where construction work is performed.

(7) Review, at least annually, the Contractor's equal employment policy and affirmative action obligations with all employees having responsibility for hiring, assignment, layoff, termination, or other employment decisions. Conduct review of this policy with all onsite supervisory personnel before initiating construction work at a job site. A written record shall be made an maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

(8) Disseminate the Contractor's equal employment policy externally by including it in any advertising in the news media, specifically including minority and female news media. Provide written notification to, and discuss this policy with, other Contractors and subcontractors with which the Contractor does or anticipates doing business.

(9) Direct recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students, and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than 1 month before the date for acceptance of applications for apprenticeship or training by any recruitment source, send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

(10) Encourage present minority and female employees to recruit minority persons and women. Where reasonable, provide after-school, summer, and vacation employment to minority and female youth both on the site and in other areas of the Contractor's workforce.

(11) Validate all tests and other selection requirements where required under 41 CFR 60-3.

(12) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities. Encourage these employees to seek or to prepare for through appropriate training, etc., opportunities for promotion.

(13) Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the Contractor's obligations under this contract are being carried out.

(14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between sexes.

(15) Maintain a record of solicitations for subcontracts for minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

(16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's equal employment policy and affirmative action obligations.

(h) The Contractor is encouraged to participate in voluntary associations that may assist in fulfilling one or more of the affirmative actions obligations contained in subparagraphs (g)(1) through (16). The efforts of a contractor association, joint contractor-union, contractor-community, or similar group of which the contractor is a member and participate may be asserted as fulfilling one or more of its obligations under subparagraphs (g)(1) through (16), provided the Contractor--

(1) Actively participates in the group;

(2) Makes every effort to ensure that the group has a positive impact on the employment of minorities and women in the industry;

(3) Ensures that concrete benefits of the program are reflected in the Contractor's minority and female workforce participation;

(4) Make a good-faith effort to meet its individual goals and timetables; and

(5) Can provide access to documentation that demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply is the Contractor's, and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

(i) A single goal for minorities and a separate single goal for women shall be established. The Contractor is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of Executive Order 11246, as amended, if a particular group is employed in a substantially disparate manner.

(j) The Contractor shall not use goals or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

(k) The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts under Executive Order 11246, as amended.

(l) The Contractor shall carry out such sanctions and penalties for violation of this clause and of the Equal Opportunity clause, including suspension, termination, and cancellation of existing subcontracts, as may be imposed or ordered under Executive Order 11246, as amended, and its implementing regulations, by the OFCCP. Any failure to carry out these sanctions and penalties as ordered shall be a violation of this clause and Executive Order 11246, as amended.

(m) The Contractor in fulfilling its obligations under this clause shall implement affirmative action procedures at least as extensive as those prescribed in paragraph (g) above, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of Executive Order 11246, as amended, the implementing regulations, or this clause, the Director shall take action as prescribed in 41 CFR 60-4.8.

(n) The Contractor shall designate a responsible official to--

(1) Monitor all employment-related activity to ensure that the Contractor's equal employment policy is being carried out;

(2) Submit reports as may be required by the Government; and

(3) Keep records that shall at least include for each employee the name, address, telephone number, construction trade, union affiliation (if any), employee identification number, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, separate records are not required to be maintained.

(o) Nothing contained herein shall be construed as a limitation upon the application of other laws that establish different standards of compliance or upon the requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

(End of clause)

48. AFFIRMATIVE ACTION FOR DISABLED AND VIETNAM ERA VETERANS (APR 1998) FAR 52.222-35

(a) *Definition.* As used in this clause--.

All employment openings includes all positions except executive and top management, those positions that will be filled from within the contractor's organization, and positions lasting 3 days or less. This term includes full-time employment, temporary employment of more than 3 days' duration, and part-time employment.

Appropriate office of the State employment service system, means the local office of the Federal-State national system of public employment offices with assigned responsibility to serve the area where the employment opening is to be filled including the District of Columbia, Guam, the Commonwealth of Puerto Rico, and the Virgin Islands.

Positions that will be filled from within the Contractor's organization means employment openings for which no considered will be given to persons outside the Contractor's organization (including affiliates, subsidiaries, and parent companies) and includes any openings that the Contractor proposes to fill from regularly established "recall" lists. The exception does not apply to a particular opening once an employee decides to consider applicants outside of its organization.

Veteran of the Vietnam era means a person who--

(1) Served on active duty for a period of more than 180 days, any part of which occurred between August 5, 1964, and May 7, 1975, and was discharged or released therefrom with other than a dishonorable discharge; or

(2) Was discharged or released from active duty fro a service-connected disability if any part of such active duty was performed between August 5, 1964, and May 7, 1975.

(b) *General*. (1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against the individual because the individual is a disabled veteran or a veteran of the Vietnam era. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified disabled veterans and veterans of the Vietnam era without discrimination based upon their disability or veterans' status in all employment practices such as--

(i) Employment;
(ii) Upgrading;
(iii) Demotion or transfer;
(iv) Recruitment;
(v) Advertising;
(vi) Layoff or termination;
(vii) Rates of pay or other forms of compensation; and
(viii) Selection for training, including apprenticeship.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Vietnam Era Veterans' Readjustment Assistance Act of 1972 (the Act), as amended.

(c) *Listing openings*. (1) The Contractor agrees to list all employment openings existing at contract award or occurring during contract performance, at an appropriate office of the State employment service system in the locality where the opening occurs. These openings include those occurring at any Contractor facility, including one not connected with performing this contract. An independent corporate affiliate is exempt from this requirement.

(2) State and local government agencies holding Federal contracts of $10,000 or more shall also list all employment openings with the appropriate office of the State employment service.

(3) The listing of employment openings with the State employment service system is required at least concurrently with using any other recruitment source or effort and involves the obligations of placing a bona fide job order, including accepting referrals of veterans and nonveterans. This listing does not require hiring any particular job applicant or hiring from any particular group of job applicants and is not intended to relieve the Contractor from any requirements of Executive orders or regulations concerning nondiscrimination in employment.

(4) Whenever the Contractor becomes contractually bound to the listing terms of this clause, it shall advise the State employment service system, in each State where it has establishments, of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these terms and has so advised the State system, it need not advise the State system of subsequent contracts. The Contractor may advise the State system when it is no longer bound by this contract clause.

(d) *Applicability*. This clause does not apply to the listing of employment openings which occur and are filled outside the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, and the Virgin Islands.

(e) *Postings*. (1) The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam era, and (ii) the rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. They shall be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance Programs, Department of Labor (Deputy Assistant Secretary), and provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of the Act, and is committed to take affirmative action to employ, and advance in employment, qualified disabled veterans and veterans of the Vietnam Era.

(f) *Noncompliance*. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(g) *Subcontracts*. The Contractor shall include the terms of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Deputy Assistant Secretary to enforce the terms, including action for noncompliance.

(End of clause)

49. AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (APR 1984) FAR 52.222-36

(a) *General*. (1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against any employee or applicant because of physical or mental handicap. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices such as--

(i) Employment;
(ii) Upgrading;
(iii) Demotion or transfer;
(iv) Recruitment;
(v) Advertising;
(vi) Layoff or termination;
(vii) Rates of pay or other forms of compensation; and
(viii) Selection for training, including apprenticeship.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Rehabilitation Act of 1973 (29 U.S.C. 793) (the Act), as amended.

(b) *Postings*. (1) The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped individuals and (ii) the rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. They shall be in a form prescribed by the Director, Office of Federal Contract Compliance Programs, Department of Labor (Director), and provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Act and is committed to take affirmative action to employ, and advance in employment, qualified physically and mentally handicapped individuals.

(e) *Noncompliance*. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(d) *Subcontracts*. The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of $2,500 unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Director to enforce the terms, including action for noncompliance.

(End of clause)

50. EMPLOYMENT REPORTS ON DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (APR 1998) FAR 52.222-37

(a) Unless the Contractor is a State or local government agency, the contractor shall report at least annually, as required by the Secretary of Labor, on--

(1) The number of disabled veterans and the number of veterans of the Vietnam era in the workplace of the contractor by job category and hiring location; and

(2) The total number of new employees hired during the period covered by the report, and of that total, the number of disabled veterans, and the number of veterans of the Vietnam era.

(b) The above items shall be reported by completing the form entitled "Federal Contractor Veterans' Employment Report VETS-100."

(c) Reports shall be submitted no later than March 31 of each year beginning March 31, 1988.

(d) The employment activity report required by paragraph (a)(2) of this clause shall reflect total hires during the most recent 12-month period as of the ending data selected for the employment profile report required by paragraph (a)(1) of this clause. Contractors may select an ending date: (1) As of the end of any pay period during the period January through March 1 of the year the report is due, or (2) as of December 31, if the contractor has previous written approval from the Equal Employment Opportunity Commission to do so for purposes of submitting the Employer Information Report EEO-1 (Standard Form 100).

(e) The count of veterans reported according to paragraph (a) of this clause shall be based on voluntary disclosure. Each contractor subject to the reporting requirements at 38 U.S.C.4212 shall invite all disabled veterans and veterans of the Vietnam era who wish to benefit under the affirmative action program at 38 U.S.C. 4212 to identify themselves to the contractor. The invitation shall state that the information is voluntarily provided; that the information will be kept confidential; that disclosure or refusal to provide the information will not subject the applicant or employee to any adverse treatment; and that the information will be used only in accordance with the regulations promulgated under 38 U.S.C. 4212.

(f) *Subcontracts*. The Contractor shall include the terms of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary.

(End of clause)

51. CLEAN AIR AND WATER (APR 1984) FAR 52.223-2

(a) "Air Act," as used in this clause, means the Clean Air Act (42 U.S.C. 7401 et seq.).

"Clean air standards," as used in this clause, means--

(1) Any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, work practices, or other requirements contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738;

(2) An applicable implementation plan as described in section 110(d) of the Air Act (42 U.S.C. 7410(d));

(3) An approved implementation procedure or plan under section 111(c) or section 111(d) of the Air Act (42 U.S.C. 7411(c) or (d)); or

(4) An approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 7412(d)).

"Clean water standards," as used in this clause, means any enforceable limitation, control, condition, prohibition, standard, or other requirement promulgated under the Water Act or contained in a permit issued to a discharger by the EPA or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

"Compliance," as used in this clause, means compliance with--

(1) Clean air or water standards; or

(2) A schedule or plan ordered or approved by a court of competent jurisdiction, the EPA, or an air or water pollution control agency under the requirements of the Air Act or Water Act and related regulations.

"Facility," as used in this clause, means any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations, owned, leased, or supervised by a Contractor or subcontractor, used in the performance of a contract or subcontract. When a location or site of operations includes more than one building, plant, installation, or structure, the entire location or site shall be deemed a facility except when the Administrator, or a designee, of the EPA determines that independent facilities are collocated in one geographical area.

"Water Act," as used in this clause, means Clean Water Act (33 U.S.C. 1251 et seq.).

(b) The Contractor agrees--

(1) To comply with the requirements of section 114 of the Clean Air Act (42 U.S.C. 7414) and section 308 of the Clean Water Act (33 U.S.C. 1318) relating to inspection, monitoring, entry, reports, and information, as well as other

requirements specified in section 114 and section 308 of the Air Act and the Water Act, and all regulations and guidelines issued to implement those acts before the award of this contract;

(2) That no portion of the work required by this prime contract will be performed in a facility listed on the EPA List of Violating Facilities on the date when this contract was awarded unless and until the EPA eliminates the name of the facility from the listing;

(3) To use best efforts to comply with clean air standards and clean water standards at the facility in which the contract is being performed; and

(4) To insert the substance of this clause into any nonexempt subcontract, including this subparagraph (b)(4).

(End of clause)

52. POLLUTION PREVENTION AND RIGHT-TO-KNOW INFORMATION (APR 1998) FAR 52.223-5

(a) Executive Order 12856 of August 3, 1993, requires Federal facilities to comply with the provisions of the Emergency Planning and Community Right-to-know Act of 1986 (EPCRA) (42 U.S.C. 11001-11050) and the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13101-13109).

(b) The Contractor shall provide all information needed by the Federal facility to comply with the emergency planning reporting requirements of Section 302 of EPCRA; the emergency notice requirements of Section 304 of EPCRA; the list of Material Data Safety Sheets required by Section 311 of EPCRA; the emergency and hazardous chemical inventory forms of Section 312 of EPCRA; the toxic chemical release inventory of Section 313 of EPCRA, which includes the reduction and recycling information required by Section 6607 of PPA; and the toxic chemical reduction goals requirements of Section 3-302 of Executive Order 12856.

(End of clause)

53. DRUG-FREE WORKPLACE (JAN 1997) FAR 52.223-6

(a) Definitions. As used in this clause--

"Controlled substance" means a controlled substance in schedules I through V of section 202 of the Controlled Substances Act (21 U.S.C. 812) and as further defined in regulation at 21 CFR 1308.11-1308.15.

"Conviction" means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes.

"Criminal drug statute" means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, possession or use of any controlled substance.

"Drug-free workplace" means the site(s) for the performance of work done by the Contractor in connection with a specific contract at which employees of the Contractor are prohibited from engaging in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance.

"Employee" means an employee of a Contractor directly engaged in the performance of work under a Government contract. "Directly engaged" is defined to include all direct cost employees and any other Contractor employee who has other than a minimal impact or involvement in contract performance.

"Individual" means an offeror/contractor that has no more than one employee including the offeror/contractor.

(b) The Contractor, if other than an individual, shall--within 30 days after award (unless a longer period is agreed to in writing for contracts of 30 days or more performance duration), or as soon as possible for contracts of less than 30 days performance duration--

(1) Publish a statement notifying its employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the Contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition;

(2) Establish an ongoing drug-free awareness program to inform such employees about--

(i) The dangers of drug abuse in the workplace;

(ii) The Contractor's policy of maintaining a drug-free workplace;

(iii) Any available drug counseling, rehabilitation, and employee assistance programs; and

(iv) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;.

(3) Provide all employees engaged in performance of the contract with a copy of the statement required by subparagraph (b)(1) of this clause;

(4) Notify such employees in writing in the statement required by subparagraph (b)(1) of this clause that, as a condition of continued employment on this contract, the employee will--

(i) Abide by the terms of the statement; and

(ii) Notify the employer in writing of the employee's conviction under a criminal drug statute for a violation occurring in the workplace no later than 5 days after such conviction.

(5) Notify the Contracting Officer in writing within 10 days after receiving notice under subdivision (b)(4)(ii) of this clause, from an employee or otherwise receiving actual notice of such conviction. The notice shall include the position title of the employee;

(6) Within 30 days after receiving notice under subdivision (b)(4)(ii) of this clause of a conviction, take one of the following actions with respect to any employee who is convicted of a drug abuse violation occurring in the workplace:

(i) Taking appropriate personnel action against such employee, up to and including termination; or

(ii) Require such employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency; and

(7) Make a good faith effort to maintain a drug-free workplace through implementation of subparagraphs (b)(1) through (b)(6) of this clause.

(c) The Contractor, if an individual, agrees by award of the contract or acceptance of a purchase order, not to engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance while performing this contract.

(d) In addition to other remedies available to the Government, the Contractor's failure to comply with the requirements of paragraph (b) or (c) of this clause may, pursuant to FAR 23.506, render the Contractor subject to suspension of contract payments, termination of the contract for default, and suspension or debarment.

(End of clause)

54. OZONE-DEPLETING SUBSTANCES (JUN 1996) FAR 52.223-11

(a) *Definition*. "Ozone-depleting substance", as used in this clause, means any substance designated as Class I by the Environmental Protection Agency (EPA) (40 CFR Part 82), including but not limited to chlorofluorocarbons, halons, carbon tetrachloride, and methyl chloroform; or any substance designated as Class II by EPA (40 CFR Part 82), including but not limited to hydrochlorofluorocarbons.

(b) The Contractor shall label products which contain or are manufactured with ozone-depleting substances in the manner and to the extent required by 42 U.S.C. 7671j (b), (c), and (d) and 40 CFR Part 82, Subpart E, as follows:

''WARNING: Contains (or manufactured with, if applicable) ____*_____, a substance(s) which harm(s) public health and environment by destroying ozone in the upper atmosphere."

*The Contractor shall insert the name of the substance(s).

(End of clause)

55. TOXIC CHEMICAL RELEASE REPORTING (OCT 1996) FAR 52.223-14

(a) Unless otherwise exempt, the Contractor , as owner or operator of a facility used in the performance of this contract, shall file by July 1 for the prior calendar year an annual Toxic Chemical Release Form (Form R) as described in sections 313(a) and (g) of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023(a) and (g)), and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106). The Contractor shall file, for each facility subject to the Form R filing and reporting requirements, the annual Form R throughout the life of the contract.

(b) A Contractor owned or operated facility used in the performance of this contract is exempt from the requirement to file an annual Form R if--

(1) The facility does not manufacture, process or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

(2) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023 (b)(1)(A);

(3) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been file with EPA);

(4) The facility does not fall within the Standard Industrial Classification Code (SIC) designations 20 through 39 as set forth in section 19.102 of the Federal Acquisition Regulation (FAR); or

(5) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

(c) If the Contractor has certified to an exemption in accordance with one or more of the criteria in paragraph (b) of this clause, and after award of the contract circumstances change so that any one of its owned or operated facilities used in the performance of this contract is no longer exempt--

(1) The Contractor shall notify the Contracting Officer; and

(2) The Contractor as owner or operator of a facility used in the performance of this contract that is no longer exempt, shall (I) submit a Toxic Chemical Release Inventory Form (Form R) on or before July 1 for the prior calendar year during which the facility becomes eligible; and (ii) continue to file the annual Form R for the life of the contract for such facility.

(d) The Contracting Officer may terminate this contract or take other action as appropriate, if the Contractor fails to comply accurately and fully with the EPCRA and PPA toxic chemical release filing and reporting requirements.

(e) Except for acquisitions of commercial items as defined in FAR Part 2, the Contractor shall--

(1) For competitive subcontracts expected to exceed $100,000 (including all options), include a solicitation provision substantially the same as the provision at FAR 52.223-13, Certification of Toxic Chemical Release Reporting; and

(2) Include in any resultant subcontract exceeding $100,000 (including all options), the substance of this clause, except this paragraph (e).

(End of clause)

56. BUY AMERICAN ACT--CONSTRUCTION MATERIALS (JUN 1997) FAR 52.225-5

NOTE: This clause applies only to contracts less than $6,500,000.

(a) *Definitions*. As used in this clause--

The Buy American Act (41 U.S.C. 10) provides that the Government give preference to domestic construction material.

"Components" means those articles, materials, and supplies incorporated directly into construction materials.

"Construction material" means an article, material, or supply brought to the construction site for incorporation into the building or work. Construction material also includes an item brought to the site pre-assembled from articles, materials or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, which are discrete systems incorporated into a public building or work and which are produced as a complete system, shall be evaluated as a single and distinct construction material regardless of when or how the individual parts or components of such systems are delivered to the construction site.

"Domestic construction material" means (1) an unmanufactured construction material mined or produced in the United States, or (2) a construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the construction materials determined to be unavailable pursuant to subparagraph 25.202(a)(2) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

(b) (1) The Buy American Act (41 U.S.C. 10a-10d) requires that only domestic construction material be used in performing this contract, except as provided in paragraphs (b)(2) and (b)(3) of this clause.

(2) This requirement does not apply to the excepted construction material or components listed by the Government as follows: (List will appear in Section H if required.)

(3) Other foreign construction material may be added to the list in paragraph (b)(2) of this clause if the Government determines that--

(i) The cost would be unreasonable (the cost of a particular domestic construction material shall be determined to be unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent, unless the agency head determines a higher percentage to be appropriate);

(ii) The application of he restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(4) The Contractor agrees that only domestic construction material will be used by the Contractor, subcontractors, material men, and suppliers in the performance of this contract, except for foreign construction materials, if any, listed in paragraph (b)(2) of this clause.

(c) *Request for determination*. (1) Contractors requesting to use foreign construction material under paragraph (b)(3) of this clause shall provide adequate information for Government evaluation of the request for a determination regarding the inapplicability of the Buy American Act. Each submission shall include a description of the foreign and domestic construction materials, including unit of measure, quantity, price, time of delivery or availability, location of the construction project, name and address of the proposed contractor, and a detailed justification of the reason for use of foreign materials cited in accordance with paragraph (b)(3) of this clause. A submission based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause. The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(2) If the Government determines after contract award that an exception to the Buy American Act applies, the contract shall be modified to allow use of the foreign construction material, and adequate consideration shall be negotiated. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration shall not be less than the differential established in paragraph (b)(3)(i) of this clause.

(3) If the Government does not determine that an exception of the Buy American Act applies, the use of that particular foreign construction material will be a failure to comply with the Act.

(d) For evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the following information any applicable supporting data based on the survey of suppliers shall be included in the request:

FOREIGN AND DOMESTIC CONSTRUCTION MATERIALS PRICE COMPARISON

Construction material description	Unit of measure	Quantity	Price (dollars) *
Item 1:			
Foreign construction material			
Domestic construction material			
Item 2:			
Foreign construction material			
Domestic construction material			

List name, address, telephone number, and contract for suppliers surveyed. Attach copy of response; if oral, attach summary. Include other applicable supporting information.

*Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued.

(End of clause)

57. RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (OCT 1996) FAR 52.225-11

(a) Unless advance written approval of the Contracting Officer is obtained, the Contractor shall not acquire for use in the performance of this contract, any supplies or services originating from sources within, or that were located in or transported from or through, countries whose products are banned from importation into the United States under regulations of the Office of Foreign Assets Control, Department of the Treasury. Those countries include Cuba, Iran, Iraq, Libya, and North Korea.

(b) The Contractor shall not acquire for use in the performance of this contract any supplies or services from entities controlled by the Government of Iraq.

(c) The Contractor agrees to insert the provisions of this clause, including this paragraph (c), in all subcontracts hereunder.

(End of clause)

58. BUY AMERICAN ACT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE TRADE AGREEMENT (JUN 1997) FAR 52.225-15

NOTE: This clause applies only to acquisitions with an acquisition value of $7,311,000 or more.

(a) *Definitions*. As used in the clause--

"Components" means those articles, materials, and supplies incorporate directly into construction materials.

"Construction material" means an article, material, or supply brought to the construction site for incorporation into the building or work. Construction material also includes an item brought to the site pre-assembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, which are discrete systems incorporated into a public building or work and which are produced as a complete system, shall be evaluated as a single and distinct construction material regardless of when or how the individual parts or components of such systems are delivered to the construction site.

"Designated country construction material" means a construction material that (a) is wholly the growth, product, or manufacture of a designated country (as defined at FAR 25.401), or (b) in the case of a construction material which consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a designated country into a new and different construction material distinct from the materials from which it was transformed.

"Domestic construction material" means (1) an unmanufactured construction material mined or produced in the United States, or (2) a construction material manufactured in the U.S., if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the construction materials determined to be unavailable pursuant to subparagraph 25.202(a)(2) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

"North American Free Trade Agreement (NAFTA) country" means Canada or Mexico.

"NAFTA country construction material" means a construction material that (a) is wholly the growth, product, or manufacture of a NAFTA country, or (b) in the case of a construction material which consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a NAFTA country into a new and different construction material distinct from the materials from which it was transformed.

(b) (1) The Buy American Act (41 U.S.C. 10a-10d) requires that only domestic construction material be used in performing this contract, except as provided in paragraphs (b)(2), (b)(3), and (b)(4) of this clause.

(2) The Trade Agreements Act and the North American Free Trade Agreement (NAFTA) provide that designated country and NAFTA country construction materials are exempted from application of the Buy American Act.

(3) The requirement in paragraph (b)(1) of this clause does not apply to the excepted construction material or components listed by the Government as follows:
(See Section H)

(4) Other foreign construction material may be added to the list in paragraph (b)(3) of this clause if the Government determines that--

(i) The cost would be unreasonable (the cost of a particular domestic construction material shall be determined to be unreasonable when the cost of such material exceeds the cost of foreign material exceeds the cost of foreign material by more than 6 percent, unless the agency head determines a higher percentage to be appropriate);

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(5) The Contractor agrees that only domestic construction materials, NAFTA country construction materials, or designated country construction materials will be used by the Contractor, subcontractors, material men, and suppliers in the performance of this contract, except for foreign construction materials if any, listed in paragraph (b)(3) of this clause.

(c) *Request for* determination. (1) Contractors requesting to use foreign construction material under paragraph (b)(4) of this clause shall provide adequate information for Government evaluation of the request for a determination regarding the inapplicability of the Buy American Act. Each submission shall include a description of the foreign and domestic construction materials, including unit of measure, quantity, price, time of delivery or availability, location of the construction project, name and address of the proposed contractor, and a detailed justification of the reason for use of foreign materials cited in accordance with paragraph (b)(4) of this clause. A submission based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause. The price of construction materials shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(2) If the Government determines after contract award that an exception to the Buy American Act applies, the contract shall be modified to allow use of the foreign construction material, and adequate consideration all be negotiated. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration all not be less than the differential established in paragraph (b)(4)(i) of this clause.

(3) If the Government does not determine that an exception to the Buy American Act applies, the use of that particular foreign construction material will be a failure to comply with the Act.

(d) For evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the following information and any applicable supporting data based on the survey of suppliers shall be included in the request:

FOREIGN AND DOMESTIC CONSTRUCTION MATERIALS PRICE COMPARISON

Construction material description	Unit of measure	Quantity	Price (dollars) *
Item 1:			
Foreign construction material			
Domestic construction material			
Item 2:			
Foreign construction material			
Domestic construction material			

List name, address, telephone number, and contract for suppliers surveyed. Attach copy of response; if oral, attach summary. Include other applicable supporting information.

*Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate is issued).

(End of clause)

59. BUY AMERICAN ACT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE TRADE AGREEMENT (MAY 1997) ALTERNATE I (MAY 1997) FAR 52.225-15 I

NOTE: This clause applies only to acquisitions with an acquisition value from $6,500,000 to $7,311,000.

(a) *Definitions*. As used in the clause--

"Components" means those articles, materials, and supplies incorporate directly into construction materials.

"Construction material" means an article, material, or supply brought to the construction site for incorporation into the building or work. Construction material also includes an item brought to the site pre-assembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, which are discrete systems incorporated into a public building or work and which are produced as a complete system, shall be evaluated as a single and distinct construction material regardless of when or how the individual parts or components of such systems are delivered to the construction site.

"Designated country construction material" means a construction material that (a) is wholly the growth, product, or manufacture of a designated country (as defined at FAR 25.401), or (b) in the case of a construction material which consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a designated country into a new and different construction material distinct from the materials from which it was transformed.

"Domestic construction material" means (1) an unmanufactured construction material mined or produced in the United States, or (2) a construction material manufactured in the U.S., if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the construction materials determined to be unavailable pursuant to subparagraph 25.202(a)(2) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

"North American Free Trade Agreement (NAFTA) country" means Canada or Mexico.

"NAFTA country construction material" means a construction material that (a) is wholly the growth, product, or manufacture of a NAFTA country, or (b) in the case of a construction material which consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a NAFTA country into a new and different construction material distinct from the materials from which it was transformed.

(b) (1) The Buy American Act (41 U.S.C. 10a-10d) requires that only domestic construction material be used in performing this contract, except as provided in paragraphs (b)(2), (b)(3), and (b)(4) of this clause.

(2) The North American Free Trade Agreement (NAFTA) provides that NAFTA construction materials are exempted from application of the Buy American Act.

(3) The requirement in paragraph (b)(1) of this clause does not apply to the excepted construction material or components listed by the Government as follows:

(See Section H)

(4) Other foreign construction material may be added to the list in paragraph (b)(3) of this clause if the Government determines that--

(i) The cost would be unreasonable (the cost of a particular domestic construction material shall be determined to be unreasonable when the cost of such material exceeds the cost of foreign material exceeds the cost of foreign material by more than 6 percent, unless the agency head determines a higher percentage to be appropriate);

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(5) The Contractor agrees that only domestic construction materials, or NAFTA country construction materials, will be used by the Contractor, subcontractors, material men, and suppliers in the performance of this contract, except for foreign construction materials, if any, listed in paragraph (b)(3) of this clause.

(c) *Request for* determination. (1) Contractors requesting to use foreign construction material under paragraph (b)(4) of this clause shall provide adequate information for Government evaluation of the request for a determination regarding the inapplicability of the Buy American Act. Each submission shall include a description of the foreign and domestic construction materials, including unit of measure, quantity, price, time of delivery or availability, location of the

construction project, name and address of the proposed contractor, and a detailed justification of the reason for use of foreign materials cited in accordance with paragraph (b)(4) of this clause. A submission based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause. The price of construction materials shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(2) If the Government determines after contract award that an exception to the Buy American Act applies, the contract shall be modified to allow use of the foreign construction material, and adequate consideration all be negotiated. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration all not be less than the differential established in paragraph (b)(4)(i) of this clause.

(3) If the Government does not determine that an exception to the Buy American Act applies, the use of that particular foreign construction material will be a failure to comply with the Act.

(d) For evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the following information and any applicable supporting data based on the survey of suppliers shall be included in the request:

FOREIGN AND DOMESTIC CONSTRUCTION MATERIALS PRICE COMPARISON

Construction material description	Unit of measure	Quantity	Price (dollars) *
Item 1:			
Foreign construction material			
Domestic construction material			
Item 2:			
Foreign construction material			
Domestic construction material			

List name, address, telephone number, and contract for suppliers surveyed. Attach copy of response; if oral, attach summary. Include other applicable supporting information.

*Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate is issued).

(End of clause)

60. SECONDARY ARAB BOYCOTT OF ISRAEL (JUN 1992) DFARS 252.225-7031

(a) *Definitions*. As used in this clause--

(1) "Foreign person" means any person other than a United States person as defined in Section 16(2) of the Export Administration Act of 1979 (50 U.S.C. App. Sec 2415).

(2) "United States person" is defined in Section 16(2) of the Export Administration Act of 1979 and means any United States resident or national (other than an individual resident outside the United States and employed by other than a United States person), any domestic concern (including any permanent domestic establishment of any foreign concern), and any foreign concern), and any foreign subsidiary or affiliate (including any permanent foreign establishment) of any domestic concern which is controlled in fact by such domestic concern, as determined under regulations of the President.

(b) *Certification*. By submitting this offer, the Offeror, if a foreign person, company or entity, certifies that it--

(1) Does not comply with the Secondary Arab Boycott of Israel; and

(2) Is not taking or knowingly agreeing to take any action, with respect to the Secondary Boycott of Israel of Arab countries, which 50 U.S.C. App. Sec. 2407(a) prohibits a United States person from taking.

(End of clause)

61. UTILIZATION OF INDIAN ORGANIZATIONS AND INDIAN-OWNED ECONOMIC ENTERPRISES (SEP 1996) FAR 52.226-1

(a) For Department of Defense contracts, this clause applies only if the contract includes a subcontracting plan incorporated under the terms of the clause at FAR 52.219-9, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan. It does not apply to contracts awarded based on a subcontracting plan submitted and approved under paragraph (g) of the clause at 52.219-9.

(b) *Definitions*. As used in this clause:

"Indian" means any person who is a member of any Indian tribe, band, group, pueblo, or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs (BIA) in accordance with 25 U.S.C. 1452(c) and any "Native" as defined in the Alaska Native Claims Settlement Act (43 U.S.C. 1601).

"Indian-organization" means the governing body of any Indian tribe or entity established or recognized by the governing body of an Indiana tribe for the purposes of 25 U.S.C., chapter 17.

"Indian-owned economic enterprise" means any Indian-owned (as determined by the Secretary of the Interior) commercial, industrial, or business activity established or organized for the purpose of profit, provided that Indian ownership shall constitute not less than 51 percent of the enterprise.

"Indian tribe" means any Indian tribe, band, group, pueblo, or community, including native villages and native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from BIA in accordance with 25 U.S.C. 1452(c).

"Interested party" means a prime contractor or an actual or prospective offeror whose direct economic interest would be affected by the award of a subcontract or by the failure to award a subcontract.

(c) The Contractor agrees to use its best efforts to give Indian organizations and Indian-owned economic enterprises (25 U.S.C. 1544) the maximum practicable opportunity to participate in the subcontracts it awards to the fullest extent consistent with efficient performance of its contract.

(1) The Contracting Officer and the Contractor, acting in good faith, may rely on the self-certification of an Indian organization or Indian-owned economic enterprise as to its eligibility, unless an interested party challenges its status or the Contracting Officer has independent reason to question that status. In the event of a challenge to the self-certification of a subcontractor, the Contracting Officer shall refer the matter to the U.S. Department of the Interior, Bureau of Indian Affairs (BIA), Attn: Chief, Division of Contracting and Grants Administration, 1849 C Street, NW, MS-334A-SIB, Washington, DC 20245. The BIA will determine the eligibility and notify the Contracting Officer. The 5 percent incentive payment will not be made within 50 workings days of subcontract award or while a challenge is pending. If a subcontractor is determined to be an ineligible participant, no incentive payment will be made under the Indian Incentive Program.

(2) The Contractor may request an adjustment under the Indian Incentive Program to the following:

(i) The estimated cost of a cost-type contract;

(ii) The target cost of a cost-plus-incentive-fee prime contract;

(iii) The target cost and ceiling price of a fixed price incentive prime contract.

(iv) The price of a firm-fixed-price prime contract.

(3) The amount of the equitable adjustment to the prime contract shall be 5 percent of the estimated cost, target cost, or firm-fixed-price included in the subcontract initially awarded to the Indian organization or Indian-owned economic enterprise.

(4) The Contractor has the burden of proving the amount claimed and must assert its request for an adjustment prior to completion of contract performance.

(d) The Contracting Officer, subject to the terms and conditions of the contract and the availability of funds, shall authorize an incentive payment of 5 percent of the amount paid to the subcontractor. The Contracting Officer shall seek funding in accordance with agency procedures. The Contracting Officer's decision is final and not subject to the Dispute clause of this contract.

(End of clause)

62. AUTHORIZATION AND CONSENT (JUL 1995) FAR 52.227-1

(a) The Government authorizes and consents to all use and manufacture, in performing any contract or any subcontract at any tier, of any invention described in and covered by a United States patent (1) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract or (2) used in machinery, tools, or methods whose use necessarily results from compliance by the Contractor or a subcontractor with (i) specifications or written provisions forming a part of this contract or (ii) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely by the provisions of the indemnity clause, if any, included in this contract or any subcontract hereunder (including any lower-tier subcontract), and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted.

(b) The Contractor agrees to include, and require inclusion of, this clause, suitably modified to identify the parties, in all subcontracts at any tier for supplies or services (including construction, architect-engineer services, and materials, supplies, models, samples, and design or testing services expected to exceed the simplified acquisition threshold);

however, omission of this clause from any subcontract, including those at or below the simplified acquisition threshold, does not affect this authorization and consent.

(End of clause)

63. PATENT INDEMNITY--CONSTRUCTION CONTRACTS (APR 1984) FAR 52.227-4

Except as otherwise provided, the Contractor agrees to indemnify the Government and its officers, agents, and employees against liability, including costs and expenses, for infringement upon any United States patent (except a patent issued upon an application that is now or may hereafter be withheld from issue pursuant to a Secrecy Order under 35 U.S.C. 181) arising out of performing this contract or out of the use or disposal by or for the account of the Government of supplies furnished or work performed under this contract.

(End of clause)

64. RIGHTS IN SHOP DRAWINGS (APR 1966) DFARS 252.227-7033

(a) Shop drawings for construction means drawings, submitted to the Government by the Construction Contractor, subcontractor or any lower-tier subcontractor pursuant to a construction contract, showing in detail(i) the proposed fabrication and assembly of structural elements and (ii) the installation (i.e., form, fit, and attachment details) of materials or equipment. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(b) This clause, including this paragraph (b), shall be included in all subcontracts hereunder at any tier.

(End of clause)

65. ADDITIONAL BOND SECURITY (OCT 1997) FAR 52.228-2

The Contractor shall promptly furnish additional security required to protect the Government and persons supplying labor or materials under this contract if--

(a) Any surety upon any bond, or issuing financial institution for other security, furnished with this contract becomes unacceptable to the Government;

(b) Any surety fails to furnish reports on its financial condition as required by the Government;

(c) The contract price is increased so that the penal sum of any bond becomes inadequate in the opinion of the Contracting Officer; or

(d) An irrevocable letter of credit (ILC) used as security will expire before the end of the period of required security. If the Contractor does not furnish an acceptable extension or replacement ILC, or other acceptable substitute, at least 30 days before an ILC's scheduled expiration, the Contracting Officer has the right to immediately draw on the ILC.

(End of clause)

66. INSURANCE--WORK ON A GOVERNMENT INSTALLATION (JAN 1997) FAR 52.228-5

(a) The Contractor shall, at its own expense, provide and maintain during the entire performance of this contract, at least the kinds and minimum amounts of insurance required in the Schedule or elsewhere in the contract.

(b) Before commencing work under this contract, the Contractor shall notify the Contracting Officer in writing that the required insurance has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the Government's interest shall not be effective (1) for such period as the laws of the State in which this contract is to be performed prescribed or (2) until 30 days after the insurer or the Contractor gives written notice to the Contracting Officer, whichever period is longer.

(c) The Contractor shall insert the substance of this clause, including this paragraph (c), in subcontracts under this contract that require work on a Government installation and shall require subcontractors to provide and maintain the insurance required in the Schedule or elsewhere in the contract. The Contractor shall maintain a copy of all subcontractors' proofs of required insurance, and shall make copies available to the Contracting Officer upon request.

(End of clause)

67. PLEDGES OF ASSETS (FEB 1992) FAR 52.228-11

(a) Offerors shall obtain from each person acting as an individual surety on a bid guarantee, a performance bond, or a payment bond--

(1) Pledge of assets; and

(2) Standard Form 28, Affidavit of Individual Surety.

(b) Pledges of assets from each person acting as an individual surety shall be in the form of--

(1) Evidence of an escrow account containing cash, certificates of deposit, commercial or Government securities, or other assets described in FAR 28.203-2 (except see 28.203-2(b)(2) with respect to Government securities held in book entry form) and/or;

(2) A recorded lien on real estate. The offeror will be required to provide--

(i) Evidence of title in the form of a certificate of title prepared by a title insurance company approved by the United States Department of Justice. This title evidence must show fee simple title vested in the surety along with any concurrent owner; whether any real estate taxes are due and payable; and any recorded encumbrances against the property, including the lien filed in favor of the Government as required by FAR 28.203-3(d);

(ii) Evidence of the amount due under any encumbrance shown in the evidence of title;

(iii) A copy of the current real estate tax assessment of the property or a current appraisal dated no earlier than 6 months prior to the date of the bond, prepared by a professional appraiser who certifies that the appraisal has been conducted in accordance with the generally accepted appraisal standards as reflected in the Uniform Standards of Professional Appraisal Practice, as promulgated by the Appraisal Foundation.

(End of clause)

68. PROSPECTIVE SUBCONTRACTOR REQUESTS FOR BONDS (OCT 1995) FAR 52.228-12

In accordance with Section 806(a)(3) of Pub. L. 102-190, as amended by Sections 2091 and 8105 of Pub. L. 103-355, upon the request of a prospective subcontractor or supplier offering to furnish labor or material for the performance of this contract for which a payment bond has been furnished to the Government pursuant to the Miller Act, the Contractor shall promptly provide a copy of such payment bond to the requester.

(End of clause)

69. FEDERAL, STATE, AND LOCAL TAXES (JAN 1991) FAR 52.229-3

(a) "Contract date," as used in this clause, means the date set for bid opening or, if this is a negotiated contract or a modification, the effective date of this contract or modification

"All applicable Federal, State, and local taxes and duties," as used in this clause, means all taxes and duties, in effect on the contract date, that the taxing authority is imposing and collecting on the transactions or property covered by this contract.

"After-imposed Federal tax," as used in this clause, means any new or increased Federal excise tax or duty, or tax that was exempted or excluded on the contract date but whose exemption was later revoked or reduced during the contract period, on the transactions or property covered by this contract that the Contractor is required to pay or bear as the result of legislative, judicial, or administrative action taking effect after the contract date. It does not include social security tax or other employment taxes.

"After-relieved Federal tax," as used in this clause, means any amount of Federal excise tax or duty, except social security or other employment taxes, that would otherwise have been payable, on the transactions or property covered by this contract, but which the Contractor is not required to pay or bear, or for which the Contractor obtains a refund or drawback, as the result of legislative, judicial, or administrative action taking effect after the contract date.

(b) The contract price includes all applicable Federal, State, and local taxes and duties.

(c) The contract price shall be increased by the amount of any after-imposed Federal tax, provided the Contractor warrants in writing that no amount for such newly imposed Federal excise tax or duty or rate increase was included in the contract price, as a contingency reserve or otherwise.

(d) The contract price shall be decreased by the amount of any after-relieved Federal tax.

(e) The contract price shall be decreased by the amount of any Federal excise tax or duty, except social security or other employment taxes, that the Contractor is required to pay or bear, or does not obtain a refund of, through the Contractor's fault, negligence, or failure to follow instructions of the Contracting Officer.

(f) No adjustment shall be made in the contract price under this clause unless the amount of the adjustment exceed $250.

(g) The Contractor shall promptly notify the Contracting Officer of all matters relating to any Federal excise tax or duty that reasonably may be expected to result in either an increase or decrease in the contract price and shall take appropriate action as the Contracting Officer directs.

(h) The Government shall, without liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax when the Contractor requests such evidence and a reasonable basis exists to sustain the exemption.

(End of clause)

70 SUPPLEMENTAL COST PRINCIPLES (DEC 1991) DFARS 52.231-7000

When the allowability of costs under this contract is determined in accordance with Part 31 of the Federal Acquisition Regulation (FAR), allowability shall also be determined in accordance with Part 231 of the Defense FAR Supplement, in effect on the date of this contract.

(End of clause)

71. PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (MAY 1997) FAR 52.232-5

(a) *Payment of price*. The Government shall pay the Contractor the contract price as provided in this contract.

(b) *Progress payments*. The Government shall make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer.

(1) The Contractor's request for progress payments shall include the following substantiation:

(i) An itemization of the amounts requested, related to the various elements of work required by the contract covered by the payment requested.

(ii) A listing of the amount included for work performed by each subcontractor under the contract.

(iii) A listing of the amount included for work performed by each subcontract under the contract.

(iv) A listing of the amounts previously paid to each such subcontractor under the contract.

(v) Additional supporting data in a form and detail required by the Contracting Officer.

(2) In the preparation of estimates, the Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site also may be taken into consideration if--

(i) Consideration is specifically authorized by this contract; and

(ii) The Contractor furnishes satisfactory evidence that it has acquired title to such material and that the material will be used to perform this contract.

(c) *Contractor certification*. Along with each request for progress payments, the Contractor shall furnish the following certification, or payment shall not be made: (However, if the Contractor elects to delete paragraph (c)(4) from the certification, the certification is still acceptable.)

I hereby certify, to the best of my knowledge and belief, that--

(1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements and the requirements of chapter 39 of Title 31, United States Code; and

(3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract; and

(4) This certification is not to be construed as final acceptance of a subcontractor's performance.

_____

(Name)

_____

(Title)

_____

(Date)

(d) *Refund of unearned amounts*. If the Contractor, after making a certified request for progress payments, discovers that a portion or all of such request constitutes a payment for performance by the Contractor that fails to conform to the specifications, terms, and conditions of this contract (hereinafter referred to as the "unearned amount"), the Contractor shall--

(1) Notify the Contracting Officer of such performance deficiency; and

(2) Be obligated to pay the Government an amount (computed by the Contracting Officer in the manner provided in paragraph (j) of this clause) equal to interest on the unearned amount from the date of receipt of the unearned amount until--

(i) The date the Contractor notifies the Contracting Officer that the performance deficiency has been corrected; or

(ii) The date the Contractor reduces the amount of any subsequent certified request for progress payments by an amount equal to the unearned amount.

(e) *Retainage*. If the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, the Contracting Officer shall authorize payment to be made in full. However, if satisfactory progress has not been made, the Contracting Officer may retain a maximum of 10 percent of the amount of the payment until satisfactory progress is achieved. When the work is substantially complete, the Contracting Officer may retain from previously withheld funds and future progress payments that amount the Contracting Officer considers adequate for protection of the Government and shall release to the Contractor all the remaining withheld funds. Also, on completion and acceptance of each separate building, public work, or other division of the contract, for which the price is stated separately in the contract, payment shall be made for the completed work without retention of a percentage.

(f) *Title, liability, and reservation of rights*. All material and work covered by progress payments made shall, at the time of payment, become the sole property of the Government, but this shall not be construed as--

(1) Relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or

(2) Waiving the right of the Government to require the fulfillment of all of the terms of the contract.

(g) *Reimbursement for bond premiums*. In making these progress payments, the Government shall, upon request, reimburse the Contractor for the amount of premiums paid for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after the Contractor has furnished evidence of full payment to the surety. The retainage provisions in paragraph (e) of this clause shall not apply to that portion of progress payments attributable to bond premiums.

(h) *Final payment*. The Government shall pay the amount due the Contractor under this contract after--

(1) Completion and acceptance of all work;

(2) Presentation of a properly executed voucher; and

(3) Presentation of release of all claims against the Government arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned under the Assignment of Claims Act of 1940 (31 U.S.C. 3727 and 41 U.S.C. 15).

(i) *Limitation because of undefinitized work*. Notwithstanding any provision of this contract, progress payments shall not exceed 80 percent on work accomplished on undefinitized contract actions. A "contract action" is any action resulting in a contract, as defined in FAR Subpart 2.1, including contract modifications for additional supplies or services, but not including contract modifications that are within the scope and under the terms of the contract, such as contract modifications issued pursuant to the Changes clause, or funding and other administrative changes.

(j) *Interest computation on unearned accounts*. In accordance with 31 U.S.C. 3903(c)(1), the amount payable under subparagraph (d)(2) of this clause shall be--

(1) Computed at the rate of average bond equivalent rates of 91-day Treasury bills auctioned at the most recent auction of such bills prior to the date the Contractor receives the unearned amount; and

(2) Deducted from the next available payment to the Contractor.

(End of clause)

72. INTEREST (JUNE 1996) FAR 52.232-17

(a) Except as otherwise provided in this contract under a Price Reduction for Defective Cost or Pricing Data clause or a Cost Accounting Standards clause, all amounts that become payable by the Contractor to the Government under this contract (net of any applicable tax credit under the Internal Revenue Code (26 U.S.C. 1481)) shall bear simple interest from the date due until paid unless paid within 30 days of becoming due. The interest rate shall be the interest rate

established by the Secretary of the Treasury as provided in Section 12 of the Contract Disputes Act of 1978 (Public Law 95-563), which is applicable to the period in which the amount becomes due, as provided in paragraph (b) of this clause, and then at the rate applicable for each six-month period as fixed by the Secretary until the amount is paid.

(b) Amounts shall be due at the earliest of the following dates:

(1) The date fixed under this contract.

(2) The date of the first written demand for payment consistent with this contract, including any demand resulting from a default termination.

(3) The date the Government transmits to the Contractor a proposed supplemental agreement to confirm completed negotiations establishing the amount of debt.

(4) If this contract provides for revision of prices, the date of written notice to the Contractor stating the amount of refund payable in connection with a pricing proposal or a negotiated pricing agreement not confirmed by contract modification.

(c) The interest charge made under this clause may be reduced under the procedures prescribed in 32.614-2 of the Federal Acquisition Regulation in effect on the date of this contract.

(End of clause)

73. ASSIGNMENT OF CLAIMS (JAN 1986) ALTERNATE I (APR 1984) FAR 52.232-23 I

(a) The Contractor, under the Assignment of Claims Act, as amended, 31 U.S.C. 3727, 41 U.S.C. 15 (hereafter referred to as "the Act"), may assign it rights to be paid amounts due or to become due as a result of the performance of this contract to a bank, trust company, or other financing institution, including any Federal lending agency. The assignee under such an assignment may thereafter further assign or reassign its right under the original assignment to any type of financing institution described in the preceding sentence. Unless otherwise stated in this contract, payments to an assignee of any amounts due or to become due under this contract shall not, to the extent specified in the Act, be subject to reduction or setoff.

(b) Any assignment or reassignment authorized under the Act and this clause shall cover all unpaid amounts payable under this contract, and shall not be made to more than one party, except that an assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in the financing of this contract.

(c) The Contractor shall not furnish or disclose to any assignee under this contract any classified document (including this contract) or information related to work under this contract until the Contracting Officer authorizes such action in writing.

(End of clause)

74. PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS (JUN 1997) FAR 52.232-27

Notwithstanding any other payment terms in this contract, the Government will make invoice payments and contract financing payments under the terms and conditions specified in this clause. Payment shall be considered as being made on the day a check is dated or an electronic funds transfer. Definitions of pertinent terms are set forth in 32.902 of the Federal Acquisition Regulation. All days referred to in this clause are calendar days, unless otherwise specified. (However, see subparagraph (a)(3) concerning payments due on Saturdays, Sundays, and legal holidays.)

(a) *Invoice Payments*--(1) *Types of invoice payments.* For purposes of this clause, there are several types of invoice payments which may occur under this contract, as follows:

(i) Progress payments, if provided for elsewhere in this contract, based on Contracting Officer approval of the estimated amount and value of work or services performed, including payments for reaching milestones in any project:

(A) The due date for making such payments shall be 14 days after receipt of the payment request by the designated billing office. However, if the designated billing office fails to annotate the payment request with the actual date of receipt at the time of receipt, the payment due date shall be the 14th day after the date of the Contractor's payment request, provided a proper payment request is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) The due date for payment of any amounts retained by the Contracting Officer in accordance with the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts, shall be as specified in the contract or, if not specified 30 days after approval for release to the Contractor by the Contracting Officer.

(ii) Final payments based on completion and acceptance of all work and presentation of release of all claims against the Government arising by virtue of the contract, and payments for partial deliveries that have been accepted by the Government (e.g., each separate building, public work, or other division of the contract for which the price is stated separately in the contract):

(A) The due date for making such payments shall be either the 30th day after receipt by the designated billing office of a proper invoice from the Contractor, or the 30th day after Government acceptance of the work or services completed by the Contractor, whichever is later. If the designated billing office fails to annotate the invoice with the date of actual receipt at the time of receipt, the invoice payment due date shall be deemed to be the 30th day after the date the Contractor's invoice, provided a proper invoice is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) On a final invoice where the payment amount is subject to contract settlement actions (e.g., release of claims), acceptance shall be deemed to have occurred on the effective date of the contract settlement.

(2) *Contractor's invoice.* The Contractor shall prepare and submit invoices to the designated billing office specified in the contract. A proper invoice must include the items listed in paragraphs (a)(2)(i) through (a)(2)(ix) of this clause. If the invoice does not comply with these requirements, it shall be returned within 7 days after the date the designated billing office received the invoice, with a statement of the reasons why it is not a property invoice. Untimely notification will be taken into account in computing any interest penalty owed the Contractor in the manner described in subparagraph (a)(4) of this clause.

(i) Name and address of the Contractor

(ii) Invoice date. (The Contractor is encouraged to date invoices as close as possible to the date of mailing or transmission.)

(iii) Contract number or other authorization for work or services performed (including order number and contract line item number).

(iv) Description of work or services performed.

(v) Delivery and payment terms (e.g., prompt payment discount terms).

(vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).

(vii) Name (where practicable), title, phone number, and mailing address of person to be notified in event of a defective invoice.

(viii) For payments described in paragraph (a)(1)(i) of this clause, substantiation of the amounts requested and certification in accordance with the requirements of the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts.

(ix) Any other information or documentation required by the contract.

(x) While not required, the Contractor is strongly encouraged to assign an identification number to each invoice.

(3) *Interest penalty.* An interest penalty shall be paid automatically by the designated payment office, without request from the Contractor, if payment is not made by the due date and the conditions listed in subdivisions (a)(3)(i) through (a)(3)(iii) of this clause are met, if applicable. However, when the due date falls on a Saturday, Sunday, or legal holiday when Federal Government offices are closed and Government business is not expected to be conducted, payment will be made on the following business day without incurring a late payment interest penalty.

(i) A proper invoice was received by the designated billing office.

(ii) A receiving report or other Government documentation authorizing payment was processed and there was no disagreement over quantity, quality, Contractor compliance with any contract term or condition, or requested progress payment amount.

(iii) In the case of a final invoice for any balance of funds due the Contractor for work or services performed, the amount was not subject to further contract settlement actions between the Government and the Contractor.

(4) *Computing penalty amount.* The interest penalty shall be at the rate established by the Secretary of the Treasury under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) that is in effect on the day after the due date, except where the interest penalty is prescribed by other governmental authority (e.g., tariffs). This rate is referred to as the "Renegotiation Board Interest Rate," and it is published in the *Federal Register* semiannually on or about January 1 and July 1. The interest penalty shall accrue daily on the invoice principal payment amount approved by the Government until the payment date of such approved principal amount, and will be compounded in 30-day increments inclusive from the first day after the due date through the payment date. That is, interest accrued at the end of any 30-day period will be

added to the approved invoice principal payment amount and be subject to interest penalties if not paid in the succeeding 30-day period. If the designated billing office failed to notify the Contractor of a defective invoice within the periods prescribed in subparagraph (a)(2) of this clause, the due date on the corrected invoice will be adjusted by subtracting the number of days taken beyond the prescribed notification of defects period. Any interest penalty owed the Contractor will be based on this adjusted due date. Adjustments will be made by the designated payment office for errors in calculating interest penalties.

(i) For the sole purpose of computing an interest penalty that might be due the Contractor for payments described in subdivision (a)(1)(ii) of this clause, Government acceptance or approval shall be deemed to have occurred constructively on the 7th day after the Contractor has completed the work or services in accordance with the terms and conditions of the contract. In the event that actual acceptance or approval occurs within the constructive acceptance or approval period the determination of an interest penalty shall be based on the actual date of acceptance or approval. Constructive acceptance or constructive approval requirements do not apply if there is a disagreement over quantity, quality, or Contractor compliance with a contract provision. These requirements also do not compel Government officials to accept work or services, approve Contractor estimates, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

(ii) The following periods of the time will not be included in the determination of an interest penalty:

(A) The period taken to notify the Contractor of defects in invoices submitted to the Government, but this may not exceed 7 days.

(B) The period between the defects notice and resubmission of the corrected invoice by the Contractor.

(C) For incorrect electronic funds transfer (EFT) information, in accordance with the EFT clause of this contract

(iii) Interest penalties will not continue to accrue after the filing of a claim for such penalties under the clause at 52.233-1, Disputes, or for more than 1 year. Interest penalties of less than $1.00 need not be paid.

(iv) Interest penalties are not required on payment delays due to disagreement between the Government and the Contractor over the payment amount or other issues involving contract compliance, or on amounts temporarily withheld or retained in accordance with the terms of the contract. Claims involving disputes, and any interest that may be payable, will be resolved in accordance with the clause at 52.233-1, Disputes.

(5) *Prompt payment discounts.* An interest penalty shall also be paid automatically by the designated payment office, without request from the Contractor, if a discount for prompt payment is taken improperly. The interest penalty will be calculated on the amount of discount taken for the period beginning with the first day after the end of the discount period through the date when the Contractor is paid.

(6) *Additional interest penalty*. (i) If this contract was awarded on or after October 1, 1989, a penalty amount, calculated in accordance with subdivision (a)(6)(iii) of this clause, shall be paid in addition to the interest penalty amount if the Contractor--

(A) Is owed an interest penalty of $1 or more;

(B) Is not paid the interest penalty within 10 days after the date the invoice amount is paid; and

(C) Makes a written demand to the designated payment office for additional penalty payment, in accordance with subdivision (a)(6)(ii) of this clause, postmarked not later than 40 days after the date the invoice amount is paid.

(ii) (A) Contractors shall support written demands for additional penalty payments with the following data. No additional data shall be required. Contractors shall--

(1) Specifically assert that late payment interest is due under a specific invoice, and request payment of all overdue late payment interest penalty and such additional penalty as may be required;

(2) Attach a copy of the invoice on which the unpaid late payment interest was due; and

(3) State that payment of the principal has been received, including the date of receipt.

(B) Demands may be postmarked on or before the 40th day after payment was made, except that--

(1) If the postmarked is illegible or nonexistent, the demand must have been received and annotated with the date of receipt by the designated payment office on or before the 40th day after payment was made; or

(2) If the postmark is illegible or nonexistent and the designated payment office fails to make the required annotation, the demand's validity will be determined by the date the Contractor has placed on the demand; provided such date is no later than the 40th day after payment was made.

(iii) (A) The additional penalty shall be equal to 100 percent of any original late payment, except--

(1) The additional penalty shall not exceed $5,000;

(2) The additional penalty shall never be less than $25; and

(3) No additional penalty is owed if the amount of the underlying interest penalty is less than $1.

(B) If the interest penalty ceases to accrue in accordance with the limits stated in subdivision (a)(4)(iii) of this clause, the amount of the additional penalty shall be calculated on the amount of interest penalty that would have accrue in the absence of these limits, subject to the overall limits on the additional penalty specified in subdivision (a)(6)(iii)(a) of the clause.

(C) For determining the maximum and minimum additional penalties, the test shall be the interest penalty due on each separate payment made for each separate contract. The maximum and minimum additional penalty shall not be based upon individual invoices unless the invoices are paid separately. Where payments are consolidated for disbursing purposes, the maximum and minimum additional penalty determination shall be made separately for each contract therein.

(D) The additional penalty does not apply to payments regulated by other Government regulations (e.g., payments under utility contracts subject to tariffs and regulation).

(b) *Contract Financing Payments*. (1) *Due dates for recurring financing payments.* If this contract provides for contract financing, requests for payment shall be submitted to the designated billing office as specified in this contract or as directed by the Contracting Officer. Contract financing payment shall be made on the 30th day after receipt of a proper contract financing request by the designated billing office. In the event that an audit or other review of a specific financing request is required to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the due date specified.

(2) *Due dates for other contract financing.* For advance payments, loans, or other arrangements that do not involve recurring submissions of contract financing requests, payment shall be made in accordance with the corresponding contract terms or as directed by the Contracting Officer.

(3) *Interest penalty not applicable.* Contract financing payments shall not be assessed an interest penalty for payment delays.

(c) *Subcontract clause requirements.* The Contractor shall include in each subcontract for property or services (including a material supplier) for the purpose of performing this contract the following:

(1) *Prompt payment for subcontractors.* A payment clause which obligates the Contractor to pay the subcontractor for satisfactory performance under its subcontract not later than 7 days from receipt of payment out of such amounts as are paid to the Contractor under this contract.

(2) *Interest for subcontractors.* An interest penalty clause which obligates the Contractor to pay to the subcontractor an interest penalty for each payment not made in accordance with the payment clause--

(i) For the period beginning on the day after the required payment date and ending on the date on which payment of the amount due to made; and

(ii) Computed at the rate of interest established by the Secretary of the Treasury, and published in the *Federal Register*, for interest payments under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligations to pay an interest penalty.

(3) *Subcontract clause flowdown* A clause requiring each subcontractor to include a payment clause and an interest penalty clause conforming to the standards set forth in subparagraphs (c)(1) and (c)(2) of this clause in each of its subcontracts, and to require each of its subcontractors to include such clauses in their subcontracts with each lower-tier subcontractor or supplier.

(d) *Subcontract clause interpretation.* The clauses required by paragraph (c) of this clause shall not be construed to impair the right of Contractor or a subcontractor at any tier to negotiate, and to include in their subcontract, provisions that--

(1) *Retainage permitted.* Permit the Contractor or a subcontractor to retain (without cause) a specified percentage of each progress payment otherwise due to a subcontractor for satisfactory performance under the subcontract without incurring any obligation to pay a late payment interest penalty, in accordance with terms and conditions agreed to by the parties to the subcontract, giving such recognition as the parties deem appropriate to the ability of a subcontractor to furnish a performance bond and payment bond;

(2) *Withholding permitted.* Permit the Contractor or subcontractor to make a determination that part or all of the subcontractor's request for payment may be withheld in accordance with the subcontract agreement; and

(3) *Withholding requirements.* Permit such withholding without incurring any obligation to pay a late payment penalty if--

(i) A notice conforming to the standards of paragraph (g) of this clause previously has been furnished to the subcontractor; and

(ii) A copy of any notice issued by a Contractor pursuant to subdivision (d)(3)(i) of this clause has been furnished to the Contracting Officer.

(e) *Subcontractor withholding procedures*. If a Contractor, after making a request for payment to the Government but before making a payment to a subcontractor for the subcontractor's performance covered by the payment request, discovers that all or a portion of the payment otherwise due such subcontractor is subject to withholding from the subcontractor in accordance with the subcontract agreement, then the Contractor shall--

(1) *Subcontractor notice*. Furnish to the subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon ascertaining the cause giving rise to a withholding, but prior to the due date for subcontractor payment;

(2) *Contracting Officer notice.* Furnish to the Contracting Officer, as soon as practicable, a copy of the notice furnished to the subcontractor pursuant to subparagraph (e)(1) of this clause;

(3) *Subcontractor progress payment reduction.* Reduce the subcontractor's progress payment by an amount not to exceed the amount specified in the notice of withholding furnished under subparagraph (e)(1) of this clause;

(4) *Subsequent subcontractor payment.* Pay the subcontractor as soon as practicable after the correction of the identified subcontract performance deficiency, and--

(i) Make such payment within--

(A) Seven days after correction of the identified subcontract performance deficiency (unless the funds therefor must be recovered from the Government because of a reduction under subdivision (e)(5)(i)) of this clause; or

(B) Seven days after the Contractor recovers such funds from the Government; or

(ii) Incur an obligation to pay a late payment interest penalty computed at the rate of interest established by the Secretary of the Treasury, and published in the *Federal Register*, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty;

(5) *Notice to Contracting Officer*. Notify the Contracting Officer upon--

(i) Reduction of the amount of any subsequent certified application for payment; or

(ii) Payment to the subcontractor of any withheld amounts of a progress payment, specifying--

(A) The amounts withheld under subparagraph (e)(1) of this clause; and

(B) The dates that such withholding began and ended; and

(6) *Interest to Government.* Be obligated to pay to the Government an amount equal to interest on the withheld payments (computed in the manner provided in 31 U.S.C. 3903(c)(1)), from the 8th day after receipt of the withheld amounts from the Government until--

(i) The day the identified subcontractor performance deficiency is corrected; or

(ii) The date that any subsequent payment is reduced under subdivision (e)(5)(i) of this clause.

(f) *Third-party deficiency reports.* (1) *Withholding from subcontractor*. If a Contractor, after making payment to a first-tier subcontractor, receives from a supplier or subcontractor of the first-tier subcontractor (hereafter referred to as a "second-tier subcontractor") a written notice in accordance with section 2 of the Act of August 24, 1935 (40 U.S.C. 270b, Miller Act), asserting a deficiency in such first-tier subcontractor's performance under the contract for which the Contractor may be ultimately liable, and the Contractor determines that all or a portion of future payments otherwise due such first-tier subcontractor is subject to withholding in accordance with the subcontract agreement, the Contractor may, without incurring an obligation to pay an interest penalty under subparagraph (e)(6) of this clause--

(i) Furnish to the first-tier subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon making such determination; and

(ii) Withhold from the first-tier subcontractor's next available progress payment or payments an amount not to exceed the amount specified in the notice of withholding furnished under paragraph (f)(1)(i) of this clause.

(2) *Subsequent payment or interest charge*. As soon as practicable, but not later than 7 days after receipt of satisfactory written notification that the identified subcontract performance deficiency has been corrected, the Contractor shall (i) Pay the amount withheld under paragraph (f)(1)(ii) of this clause to such first-tier subcontractor; or (ii) Incur an obligation to pay a late payment interest penalty to such first-tier subcontractor computed at the rate of interest established by the Secretary of the Treasury, and published in the *Federal Register*, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(g) *Written notice of subcontractor withholding.* A written notice of any withholding shall be issued to a subcontractor (with a copy to the Contracting Officer of any such notice issued by the Contractor), specifying--

(1) The amount to be withheld;

(2) The specific causes for the withholding under the terms of the subcontract; and

(3) The remedial actions to be taken by the subcontractor in order to receive payment of the amounts withheld.

(h) *Subcontractor payment entitlement.* The Contractor may not request payment from the Government of any amount withheld or retained in accordance with paragraph (d) of this clause until such time as the Contractor has determined and certified to the Contracting Officer that the subcontractor is entitled to the payment of such amount.

(i) *Prime-subcontractor disputes.* A dispute between the Contractor and subcontractor relating to the amount or entitlement of a subcontractor to a payment or a late payment interest penalty under a clause included in the subcontract pursuant to paragraph (c) of this clause does not constitute a dispute to which the United States is a party. The United States may not be interpleaded in any judicial or administrative proceeding involving such a dispute.

(j) *Preservation of prime-subcontractor rights.* Except as provided in paragraph (i) of this clause, this clause shall not limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or a subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or nonperformance by a subcontractor.

(k) *Non-recourse for prime contractor interest penalty.* The Contractor's obligation to pay an interest penalty to a subcontractor pursuant to the clauses included in a subcontract under paragraph (c) of this clause shall not be construed to be an obligation of the United States for such interest penalty. A cost reimbursement claim may not include any amount for reimbursement of such interest penalty.

(End of clause)

75. OPTIONAL INFORMATION FOR ELECTRONIC FUNDS TRANSFER PAYMENT (AUG 1996) FAR 52.232-34

(a) *Method of payment*. (1) Except as provided in paragraph (a)(2) of this clause, after the Contractor provides the information described in paragraph (d) of this clause, in accordance with paragraph (b) of this clause, payments by the Government under this contract, including invoice and contract financing payments, may be made by check or electronic funds transfer (EFT) at the option of the Government. If payment is made by EFT, the Government may, at its option, also forward the associated payment information by electronic transfer. As used in this clause, the term "EFT" refers to the funds transfer and may also include the information transfer.

(2) Notwithstanding the provision of this clause making the furnishing of EFT information optional, the Contractor shall furnish the EFT information described in paragraph (d) for any payment to be made after January 1, 1999.

(b) *Contractor consent*. (1) If the Contractor is willing to be paid by EFT, the Contractor shall provide the EFT information described in paragraph (d) of this clause. The Contractor agrees that, after providing EFT information in accordance with this clause, the Contractor cannot withdraw the Government's right to make payment by EFT for this contract.

(2) If the Contractor provides EFT information applicable to multiple contracts, the Contractor shall specifically state the applicability of this EFT information in terms acceptable to the payment office.

(c) *Contractor's EFT information*. Prior to submission of the first request for payment (whether for invoice or contract financing payment) under this contract, for which the Contractor desires EFT payment, the Contractor shall provide the information required to make contract payment by EFT, as described in paragraph (d) of this clause, directly to the Government payment office named in this contract. If more than one payment office is named for the contract, the Contractor shall provide a separate notice to each office. In the event that the EFT information changes, the Contractor shall be responsible for providing the changed information to the designated payment office(s).

(d) *Required EFT information*. The Government may make payment by EFT through either an Automated Clearing House (ACH) subject to the domestic banking laws of the United States or the Federal Reserve Wire Transfer System at the Government's option. The Contractor shall provide the following information for both methods in a form acceptable to the designated payment office. The Contractor may supply this data for this or multiple contracts (see paragraph (b) of this clause).

(1) The contract number to which this notice applies.

(2) The Contractor's name and remittance address, as stated in the contract, and account number at the Contractor's financial agent.

(3) The signature (manual or electronic, as appropriate), title, and telephone number of the Contractor official authorized to provide this information.

(4) For ACH payment only:

(i) Name, address, and 9-digit Routing Transit Number of the Contractor's financial agent.

(ii) Contractor's account number and the type of account (checking, saving, or lockbox).

(5) For Federal Reserve Wire Transfer System payments only:

(i) Name, address, telegraphic abbreviation, and 9-digit Routing Transit Number for the Contractor's financial agent

(ii) If the Contractor's financial agent is not directly on-line to the Federal Reserve Wire Transfer System and, therefore, not the receiver of the wire transfer payment, the Contractor shall also provide the name, address, and 9-digit Routing Transit Number of the correspondent financial institution receiving the wire transfer payment.

(e) *Suspension of payment*. (1) Notwithstanding the provisions of any other clause of this contract, if, after receipt of the Contractor's EFT information in accordance with paragraph (b) of this clause, the EFT information is found to be incorrect, or, for payment after January 1, 1999, if EFT information has not been furnished, then until receipt by the designated payment office of the correct EFT information from the Contractor--

(i) The Government is not required to make any further payment under this contract; and

(ii) Any invoice or contract financing request shall be deemed not to be a valid invoice or contract financing request as defined in the Prompt Payment clause of this contract.

(2) If the EFT information changes after submission of correct EFT information, the Government shall begin using the changed EFT information no later than the 30th day after its receipt to the extent payment is made by EFT. However, the Contractor may request that no further payments be made until the changed EFT information is implemented by the payment office. If such suspension would result in a late payment under the Prompt Payment clause of this contract, the Contractor's request for suspension shall extend the due date for payment by the number of days of the suspension.

(f) *Contractor EFT arrangements.* The Contractor shall designate a single financial agent capable of receiving and processing the electronic funds transfer using the EFT methods described in paragraph (d) of this clause. The Contractor shall pay all fees and charges for receipt and processing of transfers.

(g) *Liability for uncompleted or erroneous transfers*. (1) If an uncompleted or erroneous transfer occurs because the Government failed to use the Contractor-provided EFT information in the correct manner, the Government remains responsible for--

(i) Making a correct payment;

(ii) Paying any prompt payment penalty due; and]

(iii) Recovering any erroneously directed funds.

(2) If an uncompleted or erroneous transfer occurs because Contractor-provided EFT information was incorrect at the time of Government release of the EFT payment transaction instruction to the Federal Reserve System, and--

(i) If the funds are no longer under the control of the payment office, the Government is deemed to have made payment and the Contractor is responsible for recovery of any erroneously directed funds; or

(ii) If the funds remain under the control of the payment office, the Government retains the right to either make payment by mail or suspend the payment in accordance with paragraph (e) of this clause.

(h) *EFT and prompt payment.* (1) A payment shall be deemed to have been made in a timely manner in accordance with the Prompt Payment clause of this contract if, in the EFT payment transaction instruction given to the Federal Reserve System, the date specified for settlement of the payment is on or before the prompt payment due date, provided the specified payment date is a valid date under the rules of the Federal Reserve System.

(2) When payment cannot be made by EFT because of incorrect EFT information provided by the Contractor, no interest penalty is due after the date of the uncompleted or erroneous payment transaction, provided that notice of the defective EFT information is issued to the Contractor within 7 days after the Government is notified of the defective EFT information.

(i) *EFT and assignment of claims*. If the Contractor assigns the proceeds of this contract as provided for in the Assignment of Claims clause of this contract, the assignee shall provide the assignee EFT information required by paragraph (d) of this clause. In all respects, the requirements of this clause shall apply to the assignee as if it were the Contractor. EFT information which shows the ultimate recipient of the transfer to be other than the Contractor, in the absence of a proper assignment of claims acceptable to the Government, is incorrect EFT information within the meaning of paragraph (e) of this clause.

(j) *Payment office discretion*. If, after submitting the EFT information, the Contractor does not wish to receive payment by EFT methods for one or more payments, the Contractor may submit a request to the designated payment office to refrain from using the EFT payment method. The decision to grant the request is solely that of the Government.

(k) *Change of EFT information by financial agent*. The Contractor agrees that the Contractor's financial agent may notify the Government of a change to the routing transit number, Contractor account number, or account type. The Government shall use the changed data in accordance with paragraph (e)(2) of this clause. The Contractor agrees that the information provided by the agent is deemed to be correct information as if it were provided by the Contractor. The Contractor agrees that the agent's notice of changed EFT data is deemed to be a request by the Contractor in accordance with paragraph (e)(2) that no further payments be made until the changed EFT information is implemented by the payment office.

(End of clause)

76. REDUCTION OR SUSPENSION OF CONTRACT PAYMENTS UPON FINDING OF FRAUD (AUG 1992) DFARS 252.232-7006

(a) 10 U.S.C. 2307(e) permits the head of the agency to reduce or suspend further payments to the Contractor upon a written determination by the agency head that substantial evidence exists that the Contractor's request for advance, partial, or progress payments is based on fraud. The provisions of 10 U.S.C. 2307(e) are in addition to any other rights or remedies provided the Government by law or under contract.

(b) Actions taken by the Government in accordance with 10 U.S.C. 2307(e) shall not constitute an excusable delay under the Default clause of this contract or otherwise relieve the Contractor of its obligations to perform under this contract.

(End of clause)

77. DISPUTES (OCT 1995) FAR 52.233-1

(a) This contract is subject to the Contract Disputes Act of 1978, as amended (41 U.S.C. 601-613).

(b) Except as provided in the Act, all disputes arising under or relating to this contract shall be resolved under this clause.

(c) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to this contract. A claim arising under a contract, unlike a claim relating to that contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. However, a written demand or written assertion by the Contractor seeking the payment of money exceeding $100,000 is not a claim under the Act until certified as required by subparagraph (d)(2) of this clause. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim under the Act. The submission may be converted to a claim under the Act, by complying with the submission and certification requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

(d)(1) A claim by the Contractor shall be made in writing and, unless otherwise stated in this contract, submitted within 6 years after accrual of the claim to the Contracting Officer for a written decision. A claim by the Government against the Contractor shall be subject to a written decision by the Contracting Officer.

(2)(i) Contractors shall provide the certification specified in subparagraph (d)(2)(iii) of this clause when submitting any claim--

(A) Exceeding $100,000; or

(B) Regardless of the amount claimed, when using--

(1) Arbitration conducted pursuant to 5 U.S.C. 575-580; or

(2) Any other alternative means of dispute resolution (ADR) technique that the agency elects to handle in accordance with the Administrative Dispute Resolution Act (ADRA).

(ii) The certification requirement does not apply to issues in controversy that have not been submitted as all or part of a claim.

(iii) The certification shall state as follows: "I certify that the claim is made in good faith; that the supporting data are accurate and complete to the best of my knowledge and belief; that the amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable; and that I am duly authorized to certify the claim on behalf of the Contractor."

(3) The certification may be executed by any person duly authorized to bind the Contractor with respect to the claim.

(e) For Contractor claims of $100,000 or less, the Contracting Officer must, if requested in writing by the Contractor, render a decision within 60 days of the request. For Contractor-certified claims over $100,000, the Contracting Officer must, within 60 days, decide the claim or notify the Contractor of the date by which the decision will be made.

(f) The Contracting Officer's decision shall be final unless the Contractor appeals or files a suit as provided in the Act.

(g) If the claim by the Contractor is submitted to the Contracting Officer or a claim by the Government is presented to the Contractor, the parties, by mutual consent, may agree to use ADR. If the Contractor refuses an offer for alternative disputes resolution, the Contractor shall inform the Contracting Officer, in writing, of the Contractor's specific reasons for rejecting the request. When using arbitration conducted pursuant to 5 U.S.C. 575-580, or when using any other ADR technique that the agency elects to handle in accordance with the ADRA, any claim, regardless of amount, shall be accompanied by the certification described in subparagraph (d)(2)(iii) of this clause, and executed in accordance with subparagraph (d)(3) of this clause.

(h) The government shall pay interest on the amount found due and unpaid from (1) the date that the Contracting Officer receives the claim (certified, if required); or (2) the date that payment otherwise would be due, if that date is later, until the date of payment. With regard to claims having defective certification, as defined in FAR 33.201, interest shall be paid from the date that the Contracting Officer initially receives the claim. Simple interest on claim shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the Contracting Officer receives the claim and then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim.

(i) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under the contract, and comply with any decision of the Contracting Officer.

(End of clause)

78. PROTEST AFTER AWARD (AUG 1996) FAR 52.233-3

(a) Upon receipt of a notice of protest (as defined in FAR 33.101) or a determination that a protest is likely (see FAR 33.102(d)), the Contracting Officer may, by written order to the Contractor, direct the Contractor to stop performance of the work called for by this contract. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Upon receipt of the final decision in the protest, the Contracting Officer shall either--

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Default, or the Termination for Convenience of the Government, clause of this contract.

(b) If a stop-work order issued under this clause is canceled either before or after a final decision in the protest, the Contractor shall resume work. The Contracting Officer shall make an equitable adjustment in the delivery schedule or contract price, or both, and the contract shall be modified, in writing, accordingly, if--

(1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and

(2) The Contractor asserts its right to an adjustment within 30 days after the end of the period of work stoppage; *provided*, that if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon a proposal submitted at any time before final payment under this contract.

(c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.

(d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

(e) The Government's rights to terminate this contract at any time are not affected by action taken under this clause.

(f) If, as the result of the Contractor's intentional or negligent misstatement, misrepresentation, or miscertification, a protest related to this contract is sustained, and the Government pays costs, as provided in FAR 33.102(b)(2) or 33.104(h)(1), the Government may require the Contractor to reimburse the Government the amount of such costs. In addition to any other remedy available, and pursuant to the requirements of Subpart 32.6, the Government may collect this debt by offsetting the amount against any payment due the Contractor under any contract between the Contractor and the Government.

(End of clause)

79. DIFFERING SITE CONDITIONS (APR 1984) FAR 52.236-2

(a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this

contract, or (2) unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.

(b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the contract modified in writing accordingly.

(c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; *provided*, that the time prescribed in paragraph (a) of this clause for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

(End of clause)

80. SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984) FAR 52.236-3

(a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as to this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the Government.

(b) The Government assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the Government. Nor does the Government assume responsibility for any understanding reached or representation made concerning conditions that can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

(End of clause)

81. MATERIAL AND WORKMANSHIP (APR 1984) FAR 52.236-5

(a) All equipment, material, and articles incorporated into the work covered by this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide all information concerning the material or articles. When directed to do so, the Contractor shall submit samples for approval at the Contractor's expense, with all shipping at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles that to not have the required approval shall be installed or used at the risk of subsequent rejection.

(c) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may require, in writing, that the Contractor remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

(End of clause)

82. SUPERINTENDENCE BY THE CONTRACTOR (APR 1984) FAR 52.236-6

At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the worksite a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

(End of clause)

83. PERMITS AND RESPONSIBILITIES (NOV 1991) FAR 52.236-7

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any Federal, State, and municipal laws, codes, and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

(End of clause)

84. OTHER CONTRACTS (APR 1984) FAR 52.236-8

The Government may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with Government employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by Government employees.

(End of clause)

85. PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984) FAR 52.236-9

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(b) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site, and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

(End of clause)

86. OPERATIONS AND STORAGE AREAS (APR 1984) FAR 52.236-10

(a) The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.

(b) Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

(c) The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials

are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

(End of clause)

87. USE AND POSSESSION PRIOR TO COMPLETION (APR 1984) FAR 52.236-11

(a) The Government shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the Government intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Government's possession or use shall not be deemed an acceptance of any work under the contract.

(b) While the Government has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to the work resulting from the Government's possession or use, notwithstanding the terms of the clause in this contract entitled "Permits and Responsibilities." If prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

(End of clause)

88. CLEANING UP (APR 1984) FAR 52.236-12

The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. Before completing the work, the Contractor shall remove from the work and premises any rubbish, tools, scaffolding, equipment, and materials that are not the property of the Government. Upon completing the work, the Contractor shall leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer.

(End of clause)

89. ACCIDENT PREVENTION (NOV 1991)--ALTERNATE I (NOV 1991) FAR 52.236-13 I

(a) The Contractor shall provide and maintain work environments and procedures which will (1) safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities; (2) avoid interruptions of Government operations and delays in project completion dates; and (3) control costs in the performance of this contract.

(b) For these purposes on contracts for construction or dismantling, demolition, or removal of improvements, the Contractor shall--

(1) Provide appropriate safety barricades, signs, and signal lights;

(2) Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910; and

(3) Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for the purposes are taken.

(c) If this contract is for construction or dismantling, demolition or removal of improvements with any Department of Defense agency or component, the Contractor shall comply with all pertinent provisions of the latest version of U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, in effect on the date of the solicitation.

(d) Whenever the Contracting Officer becomes aware of any noncompliance with these requirements or any condition which poses a serious or imminent danger to the health or safety of the public or Government personnel, the Contracting Officer shall notify the Contractor orally, with written confirmation, and request immediate initiation of corrective action. This notice, when delivered to the Contractor or the Contractor's representative at the work site, shall be deemed sufficient notice of the noncompliance and that corrective action is required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.

(e) The Contractor shall insert this clause, including this paragraph (e), with appropriate changes in the designation of the parties, in subcontracts.

(f) Before commencing the work, the Contractor shall--

(1) Submit a written proposed plan for implementing this clause. The plan shall include an analysis of the significant hazards to life, limb, and property inherent in contract work performance and a plan for controlling these hazards; and

(2) Meet with representatives of the Contracting Officer to discuss and develop a mutual understanding relative to administration of the overall safety program.

(End of clause)

90. SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984) FAR 52.236-15

(a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring materials, plant, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payment until the Contractor submits the required schedule.

(b) The Contractor shall enter the actual progress on the chart as directed by the Contracting Officer, and upon doing so shall immediately delivery three copies of the annotated schedule to the Contracting Officer. If, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of this contract.

(End of clause)

91. SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FEB 1997) FAR 52.236-21

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by," or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(c) Where "as shown", "as indicated", "as detailed", or words of similar import are used, it shall be understood that reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place", that is furnished and installed".

(d) Shop drawings means drawings, submitted to the Government by the Contractor, subcontractor, or any lower tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., fit, and attachment details) of materials or equipment. It includes drawings,

diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the contractor to explain in detail specific portions of the work required by the contract. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the Government's reasons therefor. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation, the Contracting Officer shall issue an appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the Contracting Officer and one set will be returned to the Contractor.

(End of clause)

92. PRECONSTRUCTION CONFERENCE (FEB 1995) FAR 52.236-26

If the Contracting Officer decides to conduct a preconstruction conference, the successful offeror will be notified and will be required to attend. The Contracting Officer's notification will include specific details regarding the date, time, and location of the conference, any need for attendance by subcontractors, and information regarding the items to be discussed.

(End of clause)

93. MODIFICATION PROPOSALS--PRICE BREAKDOWN (DEC 1991)
DFARS 252.236-7000

(a) The Contractor shall furnish a price breakdown, itemized as required and within the time specified by the Contracting Officer, with any proposal for a contract modification.

(b) The price breakdown--

(1) Must include sufficient detail to permit analysis of profit, and of all costs for--

(i) Material;
(ii) Labor;
(iii) Equipment;
(iv) Subcontracts; and
(v) Overhead; and

(2) Must cover all work involved in the modification, whether the work was deleted, added, or changed.

(c) The Contractor shall provide similar price breakdowns to support any amounts claimed for subcontracts.

(d) The Contractor's proposal shall include a justification for any time extension proposed.

(End of clause)

94. BANKRUPTCY (JUL 1995) FAR 52.242-13

In the event the Contractor enters into proceedings relating to bankruptcy, whether voluntary or involuntary, the Contractor agrees to furnish, by certified mail or electronic commerce method authorized by the contract, written notification of the bankruptcy to the Contracting Officer responsible for administering the contract. This notification shall be furnished within five days of the initiation of the proceedings relating to bankruptcy filing. This notification shall include the date on which the bankruptcy petition was filed, the identity of the court in which the bankruptcy petition was filed, and a listing of Government contract numbers and contracting offices for all Government contracts against which final payment has not been made. This obligation remains in effect until final payment under this contract.

(End of clause)

95. SUSPENSION OF WORK (APR 1984) FAR 52.242-14

(a) The Contracting Officer may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified in this contract (or within a reasonable time if not specified), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by the unreasonable suspension, delay, or interruption, and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or for which an equitable adjustment is provided for or excluded under any other term or condition of this contract.

(c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

(End of clause)

96. POSTAWARD CONFERENCE (DEC 1991) DFARS 252.242-7000

The Contractor agrees to attend any postaward conference convened by the contracting activity or contract administration office in accordance with Federal Acquisition Regulation Subpart 42.5.

(End of clause)

97. CHANGES (AUG 1987) FAR 52.243-4

(a) The Contracting Officer may, at any time, without notice to the sureties, if any, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract, including changes--

(1) In the specifications (including drawings and designs);
(2) In the method or manner or performance of the work;
(3) In the Government-furnished facilities, equipment, materials, services, or site; or
(4) Directing acceleration in the performance of the work.

(b) Any other written or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; *provided*, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances, and source of the order and (2) that the Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for an adjustment based on defective specifications, no adjustment for any change under paragraph (b) of this clause shall be made for any costs incurred more than 20 days before the Contractor gives written notice as required. In the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting to the Contracting Officer a written statement describing the general nature and amount of proposal, unless this period is extended by the Government. The statement of proposal for adjustment may be included in the notice under paragraph (b) above.

(f) No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

(End of clause)

98. PRICING OF CONTRACT MODIFICATIONS (DEC 1991) DFARS 252.243-7001

When costs are a factor in any price adjustment under this contract, the contract cost principles and procedures in FAR Part 31 and DFARS Part 231, in effect on the date of this contract, apply.

(End of clause)

99. CERTIFICATION OF REQUESTS FOR EQUITABLE ADJUSTMENT (JUL 1997) DFARS 252.243-7002

(a) In accordance with 10 U.S.C. 2410(a), any request for equitable adjustment to contract terms that exceeds the simplified acquisition threshold shall bear, at the time of submission, the following certificate executed by an individual authorized to certify the request on behalf of the Contractor:

I certify that the request is made in good faith, and that the supporting data are accurate and complete to the best of my knowledge and belief.

_____
(Official's Name)

_____
(Title)

(b) The certification in paragraph (a) of this clause requires full disclosure of all relevant facts, including--

(1) Cost or pricing data if required in accordance with FAR 15.804-2; and

(2) Actual cost data and data to support any estimated costs, even if cost or pricing data are not required.

(c) The certification requirement in paragraph (a) of this clause does not apply to --

(1) Requests for routine contract payments; for example, requests for payment for accepted supplies and services, routine vouchers under a cost-reimbursement type contract, or progress payment invoices; or

(2) Final adjustments under an incentive provision of the contract.

(d) The amount requested shall accurately reflect the contract adjustment for which the Contractor believes the Government is liable. The request shall include only costs for performing the change, and shall not include any costs that already have been reimbursed or that have been separately claimed. All indirect costs included in the request shall be properly allocable to the change in accordance with applicable acquisition regulations.

(End of clause)

100. SUBCONTRACTS (FIXED-PRICE CONTRACTS) (OCT 1997) FAR 52.244-1

(a) This clause does not apply to firm-fixed-price contracts and fixed-price contracts with economic price adjustment. However, it does apply to subcontracts resulting from unpriced modifications to such contracts.

(b) "Subcontract," as used in this clause, includes but is not limited to purchase orders, and changes and modifications to purchase orders. The Contractor shall notify the Contracting Officer reasonably in advance of entering into any subcontract if the Contractor does not have an approved purchasing system and if the subcontract--

(1) Is proposed to exceed $100,000; or

(2) Is one of a number of subcontracts with a single subcontractor, under this contract, for the same or related supplies or services, that in the aggregate are expected to exceed $100,000.

(c) The advance notification required by paragraph (b) above shall include--

(1) A description of the supplies or services to be subcontracted;

(2) Identification of the type of subcontract to be used;

(3) Identification of the proposed subcontractor and an explanation of why and how the proposed subcontractor was selected, including the competition obtained;

(4) The proposed subcontract price and the Contractor's cost or price analysis;

(5) The subcontractor's current, complete, and accurate cost or pricing data and Certificate of Current Cost or Pricing Data, if required by other contract provisions;

(6) The subcontractor's Disclosure Statement or Certificate relating to Cost Accounting Standards when such data are required by other provisions of this contract; and

(7) A negotiation memorandum reflecting--

(i) The principal elements of the subcontract price negotiations;

(ii) The most significant considerations controlling establishment of initial or revised prices;

(iii) The reason cost or pricing data were or were not required;

(iv) The extent, if any, to which the Contractor did not rely on the subcontractor's cost or pricing data in determining the price objective and in negotiating the final price;

(v) The extent, if any, to which it was recognized in the negotiation that the subcontractor's cost or pricing data were not accurate, complete, or current; the action taken by the Contractor and subcontractor; and the effect of any such defective data on the total price negotiated;

(vi) The reasons for any significant difference between the Contractor's price objective and the price negotiated; and

(vii) A complete explanation of the incentive fee or profit plan when incentives are used. The explanation shall identify each critical performance element, management decisions used to quantify each incentive element, reasons for the incentives, and a summary of all trade-off possibilities considered.

(d) The Contractor shall obtain the Contracting Officer's written consent before placing any subcontract for which advance notification is required under paragraph (b) above. However, the Contracting Officer may ratify in writing any such subcontract. Ratification shall constitute the consent of the Contracting Officer.

(e) Even if the Contractor's purchasing system has been approved, the Contractor shall obtain the Contracting Officer's written consent before placing subcontracts identified below:

_____

_____

(f) Unless the consent or approval specifically provides otherwise, neither consent by the Contracting Officer to any subcontract nor approval of the Contractor's purchasing system shall constitute a determination (1) of the acceptability of any subcontract terms or conditions, (2) of the acceptability of any subcontract price or of any amount paid under any subcontract, or (3) to relieve the Contractor of any responsibility for performing this contract.

(g) No subcontract placed under this contract shall provide for payment on a cost-plus-a-percentage-of-cost basis, and any fee payable under cost-reimbursement subcontracts shall not exceed the fee limitations in subsection 15.404(c)(4)(i) of the Federal Acquisition Regulation (FAR).

(h) The Government reserves the right to review the Contractor's purchasing system as set forth in FAR Subpart 44.3

(End of clause)

101. GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS) (DEC 1989) FAR 52.245-2

NOTE: This clause applies only when the acquisition cost of all Government-furnished property to be involved in the contract is more than $100,000.

(a) *Government-furnished property*. (1) The Government shall deliver to the Contractor, for use in connection with and under the terms of this contract, the Government-furnished property described in the Schedule or specifications together with any related data and information that the Contractor may request and is reasonably required for the intended use of the property (hereinafter referred to as "Government-furnished property").

(2) The delivery or performance dates for this contract are based upon the expectation that Government-furnished property suitable for use (except for property furnished "as is") will be delivered to the Contractor at the times stated in the Schedule or, if not so stated, in sufficient time to enable the Contractor to meet the contract's delivery or performance dates.

(3) If Government-furnished property is received by the Contractor in a condition not suitable for the intended use, the Contractor shall, upon receipt of it, notify the Contracting Officer, detailing the facts, and, as directed by the Contracting Officer and at Government expense, either repair, modify, return, or otherwise dispose of the property. After completing the directed action and upon written request of the Contractor, the Contracting Officer shall make an equitable adjustment as provided in paragraph (h) of this clause.

(4) If Government-furnished property is not delivered to the Contractor by the required time, the Contracting Officer shall, upon the Contractor's timely written request, make a determination of the delay, if any, caused the Contractor and shall make an equitable adjustment in accordance with paragraph (h) of this clause.

(b) *Changes in Government-furnished property*. (1) The Contracting Officer may, by written notice, (i) decrease the Government-furnished property provided or to be provided under this contract, or (ii) substitute other Government-

furnished property for the property to be provided by the Government, or to be acquired by the Contractor for the Government, under this contract. The Contractor shall promptly take such action as the Contracting Officer may direct regarding the removal, shipment, or disposal of the property covered by such notice.

(2) Upon the Contractor's written request, the Contracting Officer shall make an equitable adjustment to the contract in accordance with paragraph (h) of this clause, if the Government has agreed in the Schedule to make the property available for performing this contract and there is any--

(i) Decrease or substitution in this property pursuant to subparagraph (b)(1) above; or

(ii) Withdrawal of authority to use this property, if provided under any other contract or lease.

(c) *Title in Government property*. (1) The Government shall retain title to all Government-furnished property.

(2) All Government-furnished property and all property acquired by the Contractor, title to which vests in the Government under this paragraph (collectively referred to as "Government property"), are subject to the provisions of this clause. However, special tooling accountable to this contract is subject to the provisions of the Special Tooling clause and is not subject to the provisions of this clause. Title to Government property shall not be affected by its incorporation into or attachment to any property not owned by the Government, nor shall Government property become a fixture or lose its identity as personal property by being attached to any real property.

(3) Title to each item of facilities and special test equipment acquired by the Contractor for the Government under this contract shall pass to and vest in the Government when its use in performing this contract commences or when the Government has paid for it, whichever is earlier, whether or not title previously vested in the Government.

(4) If this contract contains a provision directing the Contractor to purchase material for which the Government will reimburse the Contractor as a direct item of cost under this contract--

(i) Title to material purchased from a vendor shall pass to and vest in the Government upon the vendor's delivery of such material; and

(ii) Title to all other material shall pass to and vest in the Government upon--

(A) Issuance of the material for use in contract performance;

(B) Commencement of processing of the material or its use in contract performance; or

(C) Reimbursement of the cost of the material by the Government, whichever occurs first.

(d) *Use of Government property*. The Government property shall be used only for performing this contract, unless otherwise provided in the contract or approved by the Contracting Officer.

(e) *Property administration*. (1) The Contractor shall be responsible and accountable for all Government property provided under this contract and shall comply with Federal Acquisition Regulation (FAR) Subpart 45.5, as in effect on the date of this contract.

(2) The Contractor shall establish and maintain a program for the use, maintenance, repair, protection, and preservation of Government property in accordance with sound industrial practice and the applicable provisions of Subpart 45.5 of the FAR.

(3) If damage occurs to Government property, the risk of which has been assumed by the Government under this contract, the Government shall replace the items or the Contractor shall make such repairs as the Government directs. However, if the Contractor cannot effect such repairs with the time required, the Contractor shall dispose of the property as directed by the Contracting Officer. When any property for which the Government is responsible is replaced or repaired, the Contracting Officer shall make an equitable adjustment in accordance with paragraph (h) of this clause.

(4) The Contractor represents that the contract price does not include any amount for repairs or replacement for which the Government is responsible. Repairs or replacement of property for which the Contractor is responsible shall be accomplished by the Contractor at its own expense.

(f) *Access*. The Government and all its designees shall have access at all reasonable times to the premises in which any Government property is located for the purpose of inspecting the Government property.

(g) *Risk of loss*. Unless otherwise provided in this contract, the Contractor assumes the risk of, and shall be responsible for, any loss or destruction of, or damage to, Government property upon its delivery to the Contractor or upon passage of title to the Government under paragraph (c) of this clause. However, the Contractor is not responsible for reasonable wear and tear to Government property or for Government property properly consumed in performing this contract.

(h) *Equitable adjustment*. When this clause specifies an equitable adjustment, it shall be made to any affected contract provision in accordance with the procedures of the Changes clause. When appropriate, the Contracting Officer may initiate an equitable adjustment in favor of the Government. The right to an equitable adjustment shall be the Contractor's exclusive remedy. The Government shall not be liable to suite for breach of contract for--

(1) Any delay in delivery of Government-furnished property;

(2) Delivery of Government-furnished property in a condition not suitable for its intended use;

(3) A decrease in or substitution of Government-furnished property; or

(4) Failure to repair or replace Government property for which the Government is responsible.

(i) *Final accounting and disposition of Government property* Upon completing this contract, or at such earlier dates as may be fixed by the Contracting Officer, the Contractor shall submit, in a form acceptable to the Contracting Officer, inventory schedules covering all items of Government property (including any resulting scrap) not consumed in performing this contract or delivered to the Government. The Contractor shall prepare for shipment, delivery f.o.b. origin, or dispose of the Government property as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or shall be paid to the Government as the Contracting Officer directs.

(j) *Abandonment and restoration of Contractor's premises*. Unless otherwise provided herein, the Government--

(1) May abandon any Government property in place, at which time all obligations of the Government regarding such abandoned property shall cease; and

(2) Has no obligation to restore or rehabilitate the Contractor's premises under any circumstances (e.g., abandonment, disposition upon completion of need, or upon contract completion). However, if the Government-furnished property (listed in the Schedule or specifications) is withdrawn or is unsuitable for the intended use, or if other Government property is substituted, then the equitable adjustment under paragraph (h) of this clause may properly include restoration or rehabilitation costs.

(k) *Communications*. All communications under this clause shall be in writing.

(l) *Overseas contracts*. If this contract is to be performed outside of the United States of America, its territories, or possessions, the words "Government" and "Government-furnished" (wherever they appear in this clause) shall be construed as "United States Government" and "United States Government-furnished," respectively.

(End of clause)

102. GOVERNMENT-FURNISHED PROPERTY (SHORT FORM) (APR 1984) FAR 52.245-4

NOTE: This clause applies only when the acquisition cost of all Government-furnished property to be involved in the contract is $100,000 or less.

(a) The Government shall delivery to the Contractor, at the time and locations stated in this contract, the Government-furnished property described in the Schedule or specifications. If that property, suitable for its intended used, is not delivered to the Contractor, the Contracting Officer shall equitably adjust affected provisions of this contract in accordance with the Changes clause when--

(1) The Contractor submits a timely written request for an equitable adjustment; and

(2) The facts warrant an equitable adjustment.

(b) Title to Government-furnished property shall remain in the Government. The Contractor shall use the Government-furnished property only in connection with this contract. The Contractor shall maintain adequate property control records in accordance with sound industrial practice and will make such records available for Government inspection at all reasonable times, unless the clause at Federal Acquisition Regulation 52.245-1, Property Records, is included in this contract.

(c) Upon delivery of Government-furnished property to the Contractor, the Contractor assumes, the risk and responsibility for its loss or damage, except--

(1) For reasonable wear and tear;

(2) To the extent property is consumed in performing this contract; or

(3) As otherwise provided for by the provisions of this contract.

(d) Upon completing this contract, the Contractor shall follow the instructions of the Contracting Officer regarding the disposition of all Government-furnished property not consumed in performing this contract or previously delivered to the Government. The Contractor shall prepare for shipment, delivery f.o.b. origin, or dispose of the Government property, as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or shall be paid to the Government as directed by the Contracting Officer.

(e) If this contract is to be performed outside the United States of America, its territories, or possessions, the words "Government" and "Government-furnished" (wherever they appear in this clause) shall be construed as "United States Government" and "United States Government-furnished," respectively.

(End of clause)

103. REPORTS OF GOVERNMENT PROPERTY (MAY 1994) DFARS 252.245-7001

(a) The Contractor shall provide an annual report--

(1) For all DoD property for which the Contractor is accountable under the contract;

(2) Prepared in accordance with the requirements of DD Form 1662, DoD Property in the Custody of Contractors, or approved substitute, including instructions on the reverse side of the form;

(3) In duplicate, to the cognizant Government property administrator, no later than October 31.

(b) The Contractor is responsible for reporting all Government property accountable to this contract, including that at subcontractor and alternate locations.

(End of clause)

104. TRANSPORTATION OF SUPPLIES BY SEA (NOV 1995) DFARS 252.247-7023

NOTE: This clause applies only when the contractor has certified that he/she DOES anticipate supplies will be transported by sea in the performance of any contract or subcontract resulting from the solicitation.

(a) *Definitions*. As used in this clause--

(1) "Components" means articles, materials, and supplies incorporated directly into end products at any level of manufacture, fabrication, or assembly by the Contractor or any subcontractor.

(2) "Department of Defense" (DoD) means the Army, Navy, Air Force, Marine Corps, and defense agencies.

(3) "Foreign flag vessel" means any vessel that is not a U.S.-flag vessel.

(4) "Ocean transportation" means any transportation aboard a ship, vessel, boat, barge, or ferry through international waters.

(5) "Subcontractor" means a supplier, materialman, distributor, or vendor at any level below the prime contractor whose contractual obligation to perform results from, or is conditioned upon, award of the prime contract and who is performing any part of the work or other requirement of the prime contract. However, effective May 1, 1996, the term does not include a supplier, materialman, distributor, or vendor of commercial items or commercial components.

(6) "Supplies" means all property, except land and interests in land, that is clearly identifiable for eventual use or owned by the DoD at the time of transportation by sea.

(i) At item is clearly identifiable for eventual use by the DoD if, for example, the contract documentation contains a reference to a DoD contract number or a military destination.

(ii) "Supplies" includes (but is not limited to) public works; buildings and facilities; ships; floating equipment and vessels of every character, type, and description, with parts, subassemblies, accessories, and equipment; machine tools; material; equipment; stores of all kinds; end items; construction materials; and components of the foregoing.

(7) "U.S.-flag vessel" means a vessel of the United States or belonging to the United States, including any vessel registered or having national status under the laws of the United States.

(b) The Contractor shall employ U.S.-flag vessels in the transportation by sea of any supplies to be furnished in the performance of this contract. The Contractor and its subcontractors may request that the Contracting Officer authorize shipment in foreign-flag vessels, or designate available U.S.-flag vessels, if the Contractor or a subcontractor believes that--

(1) U.S.-flag vessels are not available for timely shipment;

(2) The freight charges are inordinately excessive or unreasonable; or

(3) Freight charges are higher than charges to private persons for transportation of like goods.

(c) The Contractor must submit any request for use of other than U.S.-flag vessels in writing to the Contracting Officer at least 45 days prior to the sailing date necessary to meet its delivery schedules. The Contracting Officer will process requests submitted after such date(s) as expeditiously as possible, but the Contracting Officer's failure to grant approvals to meet the shipper's sailing date will not of itself constitute a compensable delay under this or any other clause of this contract. Requests shall contain at a minimum--

(1) Type, weight, and cube of cargo;

(2) Required shipping date;

(3) Special handling and discharge requirements;

(4) Loading and discharge points;

(5) Name of shipper and consignee;

(6) Prime contract number; and

(7) A documented description of efforts made to secure U.S.-flag vessels, including points of contact (with names and telephone numbers) with at least two U.S.-flag carriers contacted. Copies of telephone notes, telegraphic and facsimile message or letters will be sufficient for this purpose.

(d) The Contractor shall, within 30 days after each shipment covered by this clause, provide the Contracting Officer and the Division of National Cargo, Office of Market Development, Maritime Administration, U.S. Department of

Transportation, Washington, DC 20590, one copy of the rated on board vessel operating carrier's ocean bill of lading, which shall contain the following information--

(1) Prime contract number;
(2) Name of vessel;
(3) Vessel flag of registry;
(4) Date of loading;
(5) Port of loading;
(6) Port of final discharge;
(7) Description of commodity;
(8) Gross weight in pounds and cubic feet if available;
(9) Total ocean freight in U.S. dollars; and
(10) Name of the steamship company.

(e) The Contractor agrees to provide with its final invoice under this contract a representation that to the best of its knowledge and belief--

(1) No ocean transportation was used in the performance of this contract;

(2) Ocean transportation was used and only U.S.-flag vessels were used for all ocean shipments under the contract;

(3) Ocean transportation was used, and the Contractor had the written consent of the Contracting Officer for all non-U.S.-flag ocean transportation; or

(4) Ocean transportation was used and some or all of the shipments were made on non-U.S.-flag vessels without the written consent of the Contracting Officer. The Contractor shall describe these shipments in the following format:

ITEM DESCRIPTION	CONTRACT LINE ITEMS	QUANTITY
TOTAL		

(f) If the final invoice does not include the required representation, the Government will reject and return it to the Contractor as an improper invoice for the purposes of the Prompt Payment clause of this contract. In the event there has been unauthorized use of non-U.S.-flag vessels in the performance of this contract, the Contracting Officer is entitled to equitably adjust the contract, based on the unauthorized use.

(g) The Contractor shall include this clause, including this paragraph (g) in all subcontracts under this contract, which exceed the simplified acquisition threshold in Part 13 of the Federal Acquisition Regulation.

(End of clause)

105. NOTIFICATION OF TRANSPORTATION OF SUPPLIES BY SEA (NOV 1995)
DFARS 252.247-7023

NOTE: This clause applies only when the contractor certifies he/she DOES NOT anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(a) The Contractor has indicated by the response to the solicitation provision, Representation of Extent of Transportation by Sea, that it did not anticipate transporting by sea any supplies. If, however, after award of this contract, the Contractor learns that supplies, as defined in the Transportation of Supplies by Sea clause of this contract, will be transported by sea, the Contractor--

(1) Shall notify the Contracting Officer of that fact; and

(2) Hereby agrees to comply with all the terms and conditions of the Transportation of Supplies by Sea clause of this contract.

(b) The Contractor shall include this clause, including this paragraph (b), revised as necessary to reflect the relationship of the contracting parties, in all subcontracts hereunder, except (effective May 1, 1996) subcontracts for the acquisition of commercial items or components.

(End of clause)

106. INSPECTION OF CONSTRUCTION (AUG 1996) FAR 52.246-12

(a) *Definition*. "Work" includes, but is not limited to, materials, workmanship, and manufacture and fabrication of components.

(b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. The Contractor shall maintain complete inspection records and make them available to the Government. All work shall be conducted under the general direction of the Contracting Officer and is subject to Government inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

(c) Government inspections and tests are for the sole benefit of the Government and do not--

(1) Relieve the Contractor of responsibility for providing adequate quality control measures;

(2) Relieve the Contractor of responsibility for damage to or loss of the material before acceptance;

(3) Constitute or imply acceptance; or

(4) Affect the continuing rights of the Government after acceptance of the complete work under paragraph (i) below.

(d) The presence or absence of a Government inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specification without the Contracting Officer's written authorization.

(e) The Contractor shall promptly furnish, at no increase in contract price, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The Government may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The Government shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

(f) The Contractor shall, without charge, replace or correct work found by the Government not to conform to contract requirements, unless in the public interest the Government consents to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(g) If the Contractor does not promptly replace or correct rejected work, the Government may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor or (2) terminate for default the Contractor's right to proceed.

(h) If, before acceptance of the entire work, the Government decides to examine already completed work by removing it or tearing it out, the Contractor, on request, shall promptly furnish all necessary facilities, labor, and material. If the work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray the expenses of the examination and of satisfactory reconstruction. However, if the work is found to meet contract requirements, the Contracting Officer shall make an equitable adjustment for the additional services involved in the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.

(i) Unless otherwise specified in the contract, the Government shall accept, as promptly as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the Government's rights under any warranty or guarantee.

(End of clause)

107. VALUE ENGINEERING--CONSTRUCTION (MAR 1989)--ALTERNATE I (APR 1984) FAR 52.248-3 I

(a) *General*. The Contractor is encouraged to develop, prepare, and submit value engineering change proposals (VECP's) voluntarily. The Contractor shall share in any instant contract savings realized from accepted VECP's, in accordance with paragraph (f) below.

(b) *Definitions*. "Collateral costs," as used in this clause, means agency costs of operation, maintenance, logistic support, or Government-furnished property.

"Collateral savings," as used in this clause, means those measurable net reductions resulting from a VECP in the agency's overall projected collateral costs, exclusive of acquisition savings, whether or not the acquisition cost changes.

"Contractor's development and implementation costs," as used in this clause, means those costs the Contractor incurs on a VECP specifically in developing, testing, preparing, and submitting the VECP, as well as those costs the Contractor incurs to make the contractual changes required by Government acceptance of a VECP.

"Government costs," as used in this clause means those agency costs that result directly from developing and implementing the VECP, such as any net increases in the cost of testing, operations, maintenance, and logistic support. The term does not include the normal administrative costs of processing the VECP.

"Instant contract savings," as used in this clause, means the estimated reduction in Contractor cost of performance resulting from acceptance of the VECP, minus allowable Contractor's development and implementation costs, including subcontractors' development and implementation costs (see paragraph (h) below).

"Value engineering change proposal (VECP): means a proposal that--

(1) Requires a change to this, the instant contract, to implement; and

(2) Results in reducing the contract price or estimated cost without impairing essential functions or characteristics; *provided*, that it does not involve a change--

(i) In deliverable end item quantities only; or

(ii) To the contract type only.

(c) VECP preparation. As a minimum, the Contractor shall include in each VECP the information described in subparagraphs (1) through (7) below. If the proposed change is affected by contractually required configuration management or similar procedures, the instructions in those procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:

(1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effect of the change on the end item's performance.

(2) A list and analysis of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revisions.

(3) A separate, detailed cost estimate for (i) the affected portions of the existing contract requirement and (ii) the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs, including any amount attributable to subcontracts under paragraph (h) below.

(4) A description and estimate of costs the Government may incur in implementing the VECP, such as test and evaluation and operating and support costs.

(5) A predicting of any effects the proposed change would have on collateral costs to the agency.

(6) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.

(7) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.

(d) *Submission*. The Contractor shall submit VECP's to the Resident Engineer at the worksite, with a copy to the Contracting Officer.

(e) *Government action*. (1) The Contracting Officer shall notify the Contractor of the status of the VECP within 45 calendar days after the contracting office receives it. If additional time is required, the Contracting Officer shall notify the Contractor within the 45-day period and provide the reason for the delay and the expected date of the decisions. The Government will process VECP's expeditiously; however, it shall not be liable for any delay in acting upon a VECP.

(2) If the VECP is not accepted, the Contracting Officer shall notify the Contractor in writing, explaining the reasons for rejection. The Contractor may withdraw any VECP, in whole or in part, at any time before it is accepted by the Government. The Contracting Officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.

(3) Any VECP may be accepted, in whole or in part, by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may accept the VECP, even though an agreement on price reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued or a contract modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The Contracting Officer's decision to accept or reject all or part of any VECP shall be final and not subject to the Disputes clause or otherwise subject to litigation under the Contract Disputes Act of 1978 (41 U.S.C. 601-613).

(f) *Sharing*. (1) *Rates*. The Government's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by (i) 45 percent for fixed-price contracts or (ii) 75 percent for cost-reimbursement contracts.

(2) *Payment*. Payment of any share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to--

(i) Accept the VECP;

(ii) Reduce the contract price or estimated cost by the amount of instant contract savings; and

(iii) Provide the Contractor's share of savings by adding the amount calculated to the contract price or fee.

(g) *Subcontracts*. The Contractor shall include an appropriate value engineering clause in any subcontract of $50,000 or more an may include one in subcontracts of lesser value. In computing any adjustment in this contract's price under paragraph (f) above, the Contractor's allowable development and implementation costs shall include any subcontractor's allowable development and implementation costs clearly resulting from a VECP accepted by the Government under this contract, but shall exclude any value engineering incentive payments to a subcontractor. The Contractor may choose any arrangement for subcontractor value engineering incentive payments; *provided*, that these payments shall not reduce the Government's share of the savings resulting from the VECP.

(h) *Data*. The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

> "These data, furnished under the Value Engineering--Construction clause of contract _____, shall not be disclosed outside the Government or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a value engineering change proposal submitted under the clause. This restriction does not limit the Government's right to use information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations."

If a VECP is accepted, the Contractor hereby grants the Government unlimited rights in the VECP and supporting data, except that, with respect to data qualifying and submitted as limited rights technical data, the Government shall have the rights specified in the contract modification implementing the VECP and shall appropriately mark the data. (The terms "unlimited rights" and "limited rights" are defined in Part 27 of the Federal Acquisition Regulation.)

(End of clause)

108. TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (SEP 1996)--ALTERNATE I (SEP 1996) FAR 52.249-2 I

(a) The Government may terminate performance of the work under this contract in whole or in part if the Contracting Officer determines that a termination is in the Government's interest. The Contracting Officer shall terminate by delivering to the Contractor a Notice of Termination specifying the extent of termination and the effective date.

(b) After receipt of a Notice of Termination and except as directed by the Contracting Officer, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause:

(1) Stop work as specified in the notice.

(2) Place no further subcontracts or orders (referred to as subcontracts in this clause) for materials, services, or facilities, except as necessary to complete the continued portion of the contract.

(3) Terminate all subcontracts to the extent they relate to the work terminated.

(4) Assign to the Government, as directed by the Contracting Officer, all right, title, and interest of the Contractor under the subcontracts terminated, in which case the Government shall have the right to settle or to pay any termination settlement proposal arising out of those terminations.

(5) With approval or ratification to the extent required by the Contracting Officer, settle all outstanding liabilities and termination settlement proposals arising from the termination settlement proposals arising from the termination of subcontracts; the approval or ratification will be final for purposes of this clause.

(6) As directed by the Contracting Officer, transfer title and delivery to the Government (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced or acquired for the work terminated, and (ii) the completed or partially completed plans, drawings, information, and other property that, if the contract had been completed, would be required to be furnished to the Government.

(7) Complete performance of the work not terminated.

(8) Take any action that may be necessary, or that the Contracting Officer may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the Government has or may acquire an interest.

(9) Use its best efforts to sell, as directed or authorized by the Contracting Officer, any property of the types referred to in subparagraph (b)(6) of this clause; *provided*, however, that the Contractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by, and at prices approved by, the Contracting Officer. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the Government under this contract, credited to the price or cost of the work, or paid in any other manner directed by the Contracting Officer.

(c) The Contractor shall submit complete termination inventory schedules no later than 120 days from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 120-day period.

(d) After expiration of the plant clearance period as defined in Subpart 45.6 of the Federal Acquisition Regulation, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of termination inventory not previously disposed of, excluding items authorized for disposition by the Contracting Officer. The Contractor may request the Government to remove those items or enter into an agreement for their storage. Within 15 days, the Government will accept title to those items and remove them or enter into a storage agreement. The Contracting Officer may verify the list upon removal of the items, or if stored, within 45 days from submission of the list, and shall correct the list, as necessary, before final settlement.

(e) After termination, the Contractor shall submit a final termination settlement proposal to the Contracting Officer in the form and with the certification prescribed by the Contracting Officer. The Contractor shall submit the proposal promptly, but no later than 1 year from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 1-year period. However, if the Contracting Officer determines that the facts justify it, a termination settlement proposal may be received and acted on after 1 year or any extension. If the Contractor fails to submit the proposal within the time allowed, the Contracting Officer may determine, on the basis of information available, the amount, if any due the Contractor because of the termination and shall pay the amount determined.

(f) Subject to paragraph (e) of this clause, the Contractor and the Contracting Officer may agree upon the whole or any part of the amount to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. However, the agreed amount, whether under this paragraph (f) or paragraph (g) of this clause, exclusive of costs shown in subparagraph (g)(3) of this clause, may not exceed the total contract price as reduced by (1) the amount of payments previously made and (2) the contract price of work not terminated. The contract shall be modified, and the Contractor paid the agreed amount. Paragraph (g) of this clause shall not limit, restrict, or affect the amount that may be agreed upon to be paid under this paragraph.

(g) If the Contractor and the Contracting Officer fail to agree on the whole amount to be paid because of the termination of work, the Contracting Officer shall pay the Contractor the amounts determined as follows, but without duplication of any amounts agreed upon under paragraph (f) of this clause:

(1) For contract work performed before the effective date of termination, the total (without duplication of any items) of--

(i) The cost of this work;

(ii) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the contract if not included in subdivision (g)(1)(i) of this clause; and

(iii) A sum, as profit on subdivision (g)(1)(i) of this clause, determined by the Contracting Officer under 49.202 of the Federal Acquisition Regulation, in effect on the date of this contract, to be fair and reasonable; however, if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, the Contracting Officer shall allow no profit under this subdivision (iii) and shall reduce the settlement to reflect the indicated rate of loss.

(2) The reasonable costs of settlement of the work terminated, including--

(i) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data;

(ii) The termination and settlement of subcontracts (excluding the amounts of such settlements); and

(iii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.

(h) Except for normal spoilage, and except to the extent that the Government expressly assumed the risk of loss, the Contracting Officer shall exclude from the amounts payable to the Contractor under paragraph (g) of this clause, the fair value, as determined by the Contracting Officer, of property that is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government or to a buyer.

(i) The cost principles and procedures of Part 31 of the Federal Acquisition Regulation, in effect on the date of this contract, shall govern all costs claimed, agreed to, or determined under this clause.

(j) The Contractor shall have the right of appeal, under the Disputes clause, from any determination made by the Contracting Officer under paragraph (e), (g), or (l) of this clause, except that if the Contractor failed to submit the termination settlement proposal or request for equitable adjustment within the time provided in paragraph (e) or (l), respectively, and failed to request a time extension, there is not right of appeal.

(k) In arriving at the amount due the Contractor under this clause, there shall be deducted--

(1) All unliquidated advance or other payments to the Contractor under the terminated portion of this contract;

(2) Any claim which the Government has against the Contractor under this contract; and

(3) The agreed price for, or the proceeds of sale of, materials, supplies, or other things acquired by the Contractor or sold under the provisions of this clause and not recovered by or credited to the Government.

(l) If the termination is partial, the Contractor may file a proposal with the Contracting Officer for an equitable adjustment of the price(s) of the continued portion of the contract. The Contracting Officer shall make any equitable adjustment agreed upon. Any proposal by the Contractor for an equitable adjustment under this clause shall be requested within 90 days from the effective date of termination unless extended in writing by the Contracting Officer.

(m)(1) The Government may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the terminated portion of the contract, if the Contracting Officer believes the total of these payments will not exceed the amount to which the Contractor will be entitled.

(2) If the total payments exceed the amount finally determined to be due, the Contractor shall repay the excess to the Government upon demand, together with interest computed at the rate established by the Secretary of the Treasury under 50 U.S.C. App. 1215(b)(2). Interest shall be computed for the period from the date the excess payment is received by the Contractor to the date the excess is repaid. Interest shall not be charged on any excess payment due to a reduction in the Contractor's termination settlement proposal because of retention or other disposition of termination inventory until 10 days after the date of the retention or disposition, or a later date determined by the Contracting Officer because of the circumstances.

(n) Unless otherwise provided in this contract or by statute, the Contractor shall maintain all records and documents relating to the terminated portion of this contract for 3 years after final settlement. This includes all books and other evidence bearing on the Contractor's costs and expenses under this contract. The Contractor shall make these records and documents available to the Government, at the Contractor's office, at all reasonable times, without any direct charge. If approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions may be maintained instead of original records and documents.

(End of clause)

109. DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984) FAR 52.249-10

(a) If the Contractor refuses or fails to prosecute the work or any separable part, with the diligence that will insure its completion within the time specified in this contract including any extension, or fails to complete the work within this time, the Government may, by written notice to the Contractor, terminate the right to proceed with the work (or the separable part of the work) that has been delayed. In this event, the government may take over the work and complete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the Government resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the Government in completing the work.

(b) The Contractor's right to proceed shall not be terminated nor the Contractor charged with damages under this clause, if--

(1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God or of the public enemy, (ii) acts of the Government in either its sovereign or contractual capacity, (iii) acts of another Contractor in the performance of a contract with the Government, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any delay (unless extended by the Contracting Officer), notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, the time for completing the work shall be extended. The findings of the Contracting Officer shall be final and conclusive on the parties, but subject to appeal under the Disputes clause.

(c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been issued for the convenience of the Government.

(d) The rights and remedies of the Government in this clause are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

110. COMPUTER GENERATED FORMS (JAN 1991) FAR 52.253-1

(a) Any data required to be submitted on a Standard or Optional Form prescribed by the Federal Acquisition Regulation (FAR) may be submitted on a computer generated version of the form, *provided* the form carries the Standard or Optional Form number and edition data.

(b) Unless prohibited by agency regulations, any data required to be submitted on an agency unique form prescribed by an agency supplement to the FAR may be submitted on a computer generated version of the form provided there is no change to the name, content, or sequence of the data elements on the form and provided the form carries the agency form number and edition data.

(c) If the Contractor submits a computer generated version of a form that is different than the required form, then the rights and obligations of the parties will be determined based on the content of the required form.

(End of clause)

END OF SECTION 00700

SECTION 00800 - SPECIAL CONTRACT REQUIREMENTS

1. COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK:

a. The Contractor shall be required to (i) commence work under this contract within 5 calendar days after the date the Contractor receives the notice to proceed, (ii) prosecute the work diligently, and (iii) complete the entire work ready for use not later than 300 calendar days after the date the Contractor receives the notice to proceed. See also work restrictions, paragraph b, below. The time stated for completion shall include the final cleanup of the premises. FAR 52.212-3 (APR 1984)

b. Work Restrictions: The Contractor shall not be allowed to work on Federal Holidays and times when the Base may be closed. Normal duty hours for work shall be from 7:30 AM to 4:15 PM, Monday through Friday. Requests for additional work hours shall require written approval from the Contracting officer at least 5 days in advance of the proposed work period. Due to an air show scheduled for Sept. 12, 13, 1998, an exclusionary period of 6 days, beginning at 5 PM Wednesday, 9 Sept. 1998, and ending 7 AM Wednesday, September 16, 1998, will preclude any contractor work on this site. The contractor is to secure the area and remove all trash prior to commencement of the exclusionary period.

c. All electrical outages shall be scheduled 48 hours in advance.

d. Use of cranes is to be coordinated with the Contracting Officer.

e. Location: The site of work is located at Westover ARB, MA. The site of the work is on a "enclosed" military reservation and all rules and regulations issued by the Commanding Officer covering general safety, security, and sanitary requirements, etc., shall be observed by the Contractor. The contractors work can not go beyond the "red line" security line. The construction site is adjacent to a high noise area.

f. The contractor is required to procure and submit two weeks in advance a dig permit using the base Air Force Form 103.

g. The Contractor shall furnish all labor, materials, equipment, and services (except those furnished by the Government)for the following work:

BASE BID

Bid Item 1A

The complete firefighter training facility, including all site preparatory and finish work, except as described hereinafter for additive bid items. This bid item includes all work associated with earthwork, erosion control, storm drainage, sanitary sewer, water distribution, aggregate surfacing (except as otherwise defined hereinafter), asphalt concrete pavement, trench for burn pit, holding pond, ignitor water jacket supply, drain piping, nitrogen piping, airframe sprinkler piping, LPG piping/tank support, electrical ignitors, truck unloading station, electrical service rack, control tower/safety stand/piping, site power, grounding, site lighting, cathodic protection and accessory items. The contractor is responsible for modifying the piping and electrical layouts, etc. for the proper plane orientation so that the nose of the plane is inline and pointing at the control tower and facing due west.

Bid Item 1B

The complete air frame mock-up. This bid item includes the steel fabrication/installation related to the mock-up.

OPTION BID ITEMS

Option Bid Item 1

Smokehouse, complete with aggregate surfacing around the smokehouse and associated storm drainage.

2. LIQUIDATED DAMAGES CONSTRUCTION: (APR 1984) (FAR 52.212-5)

a. If the Contractor fails to complete the work within the time specified in the contract, or any extension, the Contractor shall pay to the Government as liquidated damages, the sum of $ 385.00 for each day of delay.

b. If the Government terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the

Government in completing the work.

c. If the Government does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

3. EQUAL OPPORTUNITY PREAWARD CLEARANCE OF SUBCONTRACTS: (1984 APR)

Notwithstanding the clause of this contract entitled "Subcontracts", the Contractor shall not enter into a first-tier subcontract for an estimated or actual amount of $1 million or more without obtaining in writing from the Contracting Officer clearance that the proposed subcontractor is in compliance with the equal opportunity requirements and therefore is eligible for award. (FAR 52.222-28)

4. INSURANCE - WORK ON A GOVERNMENT INSTALLATION

a. The Contractor shall procure and maintain during the entire period of his performance under this contract the following minimum insurance:

(1) General Liability Insurance (Comprehensive form of policy): Bodily Injury Liability - $500,000 per occurrence.

(2) Automobile Liability Insurance (Comprehensive form of policy):

Bodily Injury Liability - $200,000 per person and$500,000 per accident.

Property Damage Liability - $20,000 per accident.

(3) Workmen's Compensation and Employer's Liability Insurance:

a. Compliance with applicable workmen's compensation and occupational disease statutes is required. Employers' liability coverage in the minimum amount of $100,000 is also required.

b. Prior to the commencement of work hereunder, the Contractor shall furnish to the Contracting Officer a certificate or statement of the above required insurance. The policies evidencing required insurance shall contain an endorsement to the effect that cancellation or any material change in the policies adversely affecting the interests of the Government in such insurance shall not be effective for such a period as may be prescribed by the laws of the State in which this contract is to be performed and in no event less than thirty (30) days after written notice thereof to the Contracting Officer.

c. The Contractor agrees to insert the substances of this clause, including this paragraph c., in all subcontracts hereunder.

5. PERFORMANCE OF WORK BY THE CONTRACTOR: (1984 APR)

The Contractor shall perform on the site, and with its own organization, work equivalent to at least twenty (20) percent of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.(FAR 52.236-1)

6. CERTIFICATE OF COMPLIANCE:

Any certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in 4 copies. Each certificate shall be signed by an official authorized to certify in behalf of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the Contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements. (ECI 7-670.3)

7. IMPLEMENTING GUARANTEES:

At any time subsequent to the acceptance by the Government of a completed installation under this contract, which installation is required to be covered by a specific guarantee under the terms of the various sections in the TECHNICAL PROVISIONS, the Base Commander will be an authorized party

for the purpose of implementing the provisions of such guarantees in behalf of the Government.

8. BID GUARANTEE:

See Section 00700 CONTRACT CLAUSES.

9. CONTRACT DRAWINGS, MAPS AND SPECIFICATIONS:

FILE NO. TITLE

SEE INDEX OF DRAWINGS ON DRAWING X-1.

10. RECORD DRAWINGS:

(a) General: The Contractor will maintain as-built drawings during the construction and will develop final record drawings at the completion of individual facilities.

(b) Computer-Aided Drafting (CAD): If CAD files are available for the project and in addition to all other requirements indicated herein, the contractor shall be required to update the Computer-Aided Drafting (CAD) record for the project drawings consisting of computer disks or magnetic media in AutoCAD 12 format for the project. If available the CAD record will be presented to the contractor in addition to the mylar reproducible drawings after the approval of progress prints as indicated in para. "Preliminary Submittal", below. The contractor will update the CAD record identical to the final as-built drawings, and will return the CAD record to the Contracting Officer's Representative with the same time requirements and late penalty as indicated in paragraph "Final Requirements", below. Scanned drawings will not be acceptable. All other requirements indicated herein will still apply. The Contractor may use the updated CAD record to print blue-line or mylar drawings as required.

(c) Progress As-Built Prints: The Contractor shall mark up one set of paper prints to show as-built construction conditions. These as-built prints shall be kept current and available on the job site at all times. All changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes. The as-built prints will be jointly inspected for accuracy and completeness by the Contracting Officer's representative and a responsible representative of the Contractor prior to submission of each monthly pay estimate. The prints shall show the following information, but not limited thereto:

(1) The location and description of any utility lines, valves, or other installations of any kind within the construction area. The location includes dimensions to permanent features.
(2) The location and dimensions of any changes with the building and structure.
(3) Correct grade or alignment of roads, structures or utilities if any changes were made from the contract plans.
(4) Correct elevations if changes were made in site grading.
(5) Changes in details of design or additional information obtained from working drawings specified to be prepared and/ or furnished by the Contractor including but not limited to fabricated, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.
(6) The topography and grades of all drainage installed or affected as part of the project construction.
(7) All changes which result from contract modifications.
(8) Where contract drawings or specifications allow options, only the option selected for construction shall be shown on the as-built prints.
(9) All amendments to the contract drawings issued during the solicitation period shall be posted on the as-built drawings.

(d) Preliminary Submittal: The Contractor shall prepare two copies of progress prints and these shall be delivered to the Contracting Officer at the time of final inspection of individual facilities for his review and approval. These as-built prints shall be neat, legible and accurate. Upon approval, one copy of the as-built prints will be returned to the Contractor for use in preparation of final as-built drawings. Upon review, if the drawings are found to contain errors and/or omission, they shall be returned to the Contractor for corrections and return of the as-built prints to the Contracting Officer within ten (10) calendar days.

(e) Record Drawing Preparation: After approval of the progress as-built prints, the mylar drawings shall be modified as may be necessary to correctly show all the features of the project as it has been constructed by bringing the contract set into agreement with the approved as-built prints, adding such additional drawings as may be necessary. The Contractor shall be responsible for the protection and safety thereof until returned to the Contracting Officer. Any drawings

damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at his expense.

(1) Only personnel proficient in the preparation of engineering drawings to standards satisfactory and acceptable to the Government shall be employed to modify the mylar reproduction drawings or prepare additional new drawings. All additions and corrections to the contract drawings shall be neat, clean and legible, and shall match the adjacent line work and/or lettering being annotated in type, density, size and style. All drafting work shall be done using the same medium (pencil, plastic lead or ink) that was employed on the original contract drawings and with graphic lead on paper base material. The Contracting Officer will review all record drawings for accuracy and conformance to the above specified drafting standards. The Contractor shall make all corrections, changes, additions and deletions required to meet these standards. The title block to be used for any new as-built drawings shall be similar to that used on the original contract drawings.

(2) When final revisions have been completed, each drawing shall be lettered or stamped with the words "RECORD DRAWING AS-BUILT" followed by the name of the Contractor in lettering at least 3/16" high. All original contract drawings shall be marked either "As-Built" drawing denoting no revision on the sheet or "Revised As-Built" denoting one or more revisions. All revisions to the original contract drawings will be dated in the revision block.

(f) Final Requirements: After receipt by the Contractor of the approved as-built prints and the mylar reproducible drawings, the Contractor will make final record drawings submitted within 30 days. The submittal shall consist of the completed record drawings, two blue line prints of these drawings and the return of the approved marked-up as-built prints. They shall be complete in all details. All paper prints and reproducible drawings will become property of the Government upon final approval. Failure approval. Failure to submit as-built drawings and final record drawings as required herein shall be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of the final record drawings shall be accomplished before final payment is made to the Contractor.

(g) Beneficial Occupancy Drawings: If the Government accepts beneficial occupancy of a facility, and the Contractor is unable to provide the final record drawings within 45 days after the date of beneficial occupancy, the Contractor shall provide paper sepias for that facility. The paper sepias shall incorporate all changes to as-built drawings made up to the time of beneficial occupancy. Contractor is still obligated to comply with "Final Requirements" paragraph above.

(h) Payment: No separate payment will be made for the as-built and record drawings required under this contract whether or not CAD record is updated, and all costs in connection therewith shall be considered a subsidiary obligation of the Contractor.

11. DESIGNATION OF PROPERTY ADMINISTRATOR:

The Chief, Property and Accounting Section, U.S. Army Engineer District, New York, Federal Building, 26 Federal Plaza, New York, N.Y. 10278-0090 is designated as Property Administrator in connection with this contract.

12. PHYSICAL DATA:

Information and data furnished or referred to below are furnished for the Contractor's information. However, it is expressly understood that the Government will not be responsible for any interpretation or conclusion drawn therefrom by the Contractor. (FAR 52.236-4) (APR 1984)

a. Weather Conditions: Climatological data available from records at Westover ARB.

See also paragraph entitled TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER.

b. Transportation Facilities:

(1) Railroads: No railroad serves the locality of the proposed work. The Contractor shall make all arrangements at his expense for the use of sidings necessary for the delivery of materials, equipment, supplies, and other facilities required for completion of the work. The Contractor's use of sidings must be arranged so as not to interrupt or delay the operation of the Military reservation.

(2) Highways and Roads: State Route 33, Patroit Avenue & Industrial Road serve the locality of the proposed work. Roads within the military reservation proposed to be used by the Contractor, shall be subject to prior approval of the Post authorities and such roads, if used, shall be maintained throughout construction and shall be restored to as good condition as existed prior to their use. The Contractor shall also construct such temporary haul roads and bridges as may be

necessary for the conduct of his work. Any such temporary construction shall be restored to its original condition. All costs for the use of existing transportation facilities, for the construction of temporary facilities, and for maintenance, repair, removal and restoration shall be borne by the Contractor.

c. Spills and Spill Reporting: See Section 01560 Environmental Requirements, Paragraph 3.8 for requirements.

13. PRICING OF ADJUSTMENTS:
When costs are a factor in any determination of a contract price adjustment pursuant to the Changes clause or any other clause of this contract, such costs shall be in accordance with Part 31 of the Federal Acquisition Regulation and DFARS 52.215-7000 (APR 1985) as follows: In determining whether a pricing adjustment is expected to exceed $100,000, the term "pricing adjustment" shall mean "the aggregate increases and/or decreases in cost plus applicable profits."

14. PAYMENT FOR MATERIALS DELIVERED OFF-SITE:

Pursuant to the Contract Clauses in this contract titled "Payments Under Fixed-Price Construction Contracts", materials delivered to the Contractor at locations other than the site of the work may be taken into consideration in making payments if included in payment estimates and if all the conditions of the Contract Clauses are fulfilled. Payment for items delivered to locations other than the work site will be limited to those materials which have been approved, if required by the technical provisions; those materials which have been fabricated to the point where they are identifiable to an item of work required under this contract. Such payment will be made only after receipt of paid or receipted invoices or invoices with canceled check showing title to the items in the prime contractor and including the value of materials and labor incorporated into the item.

15. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE:

a. Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a contractor or subcontractor at any tier shall be based on actual cost data when the Government can determine both ownership and operating costs for each piece of equipment or equipment groups of similar serial and series from the Contractor's accounting records. When both ownership and operating costs cannot be determined from the Contractor's accounting records, equipment costs shall be based upon the applicable provisions of EP 1110-1-8, *"Construction Equipment Ownership and Operating Expense Schedule," Region 1.

Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the Contracting Officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retrospective pricing, the schedule in effect at the time the work was performed shall apply.

(* This manual can be ordered from the Government Printing Office by calling Tel. No. (202) 783-3238. There is a charge for the manual.)

b. Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36 substantiated by certified copies of paid invoices. Rates for equipment rented from an organization under common control, lease-purchase or sale-leaseback arrangements will be determined using the schedule except that rental costs leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees are allowable. Costs for major repairs and overhaul are unallowable.

c. When actual equipment costs are proposed and the total amount of the pricing action is over $25,000, cost or pricing data shall be submitted on Standard Form 1411, "Contract Pricing Proposal Cover Sheet." By submitting cost or pricing data, the Contractor grants to the Contracting Officer or an authorizing representative the right to examine those books, records, documents and other supporting data that will permit evaluation of the proposed equipment costs. After price agreement the contractor shall certify that the equipment costs or pricing data submitted are accurate, complete and current.

16. ALTERATIONS IN CONTRACT: (APR 1984)

Portions of this contract are altered as follows:

Add the following sentence to paragraph "g" of basic contract clause, SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (1984 APR):

"Upon completing the work under this contract, the Contractor shall furnish a complete set of all

shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the equipment is completed and accepted.
"Alt.1 (APR 1984) FAR 52.236-21 (7-602.54 (b) (1) OCT 1976)

17. AVAILABILITY AND USE OF UTILITY SERVICES: (APR 1984)

a. The Government shall make all reasonably amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

b. The Contractor, at its expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all temporary connections, distribution lines, meters and associated paraphernalia. (FAR 52.236-14)

18. SALVAGE MATERIALS AND EQUIPMENT: (JAN 1965)

The Contractor shall maintain adequate property control records for all materials or equipment specified to be salvaged. These records may be in accordance with the Contractor's system of property control, if approved by the property administrator. The Contractor shall be responsible for the adequate storage and protection of all salvaged materials and equipment and shall replace, at no cost to the Government, all salvage materials and equipment which are broken or damaged during salvage operations as the result of his negligence, or while in his care. (DOD FAR Supplement 52.236-7005)

19. IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY: (APR 1984)

NOT USED.

20. CONSTRUCTION PROJECT SIGNS:

20.1 General. The Contractor shall furnish and erect at the location directed one project sign. Exact placement location will be designated by the Contracting Officer. The panel sizes and graphic formats have been standardized for visual consistency throughout all Corps operations.

Panels are fabricated using HDO plywood with dimensional lumber uprights and bracing.

All legends are to be painted in the sizes and styles as specified by the graphic formats shown at the end of this section. The signs (including back and edges), posts and braces shall be given two coats of Benjamin Moore No. 120-60 poly-silicone enamel or approved equal before lettering. The 4' x 4' right section of the project sign shall be white with black lettering. Paint colors shall be as follow:

Black - Federal Standard 595a Color Number 27038
White - Federal Standard 595a Color Number 27875
Red - PANTONE 032

An example of the sign including mounting and fabrication details is also provided at the end of this section.

Name of the project shall be as follows:

Fire Training Facility
Westover Air Reserve Base, MA

20.2 Erection and Maintenance. The signs shall be erected at the designated location(s). Signs shall be plumb and backfill of postholes shall be well tamped to properly support the signs in position throughout the life of the contract. The signs shall be maintained in good condition until completion of the contract, shall remain the property of the Contractor, and shall be removed from the site upon completion of work under the contract.

20.3 The Corps of Engineers logo will be provided by the Contracting Officer.

20.4 Payment. No separate payment will be made for furnishing and erecting the project signs

as specified and costs thereof shall be considered a subsidiary obligation of the Contractor.

21. LABOR SURPLUS AREA EXPENDITURE REQUIREMENTS: (JUL 1978)

a. The site of the construction work is located in an area determined by the Secretary of Labor to be a Labor Surplus Area. Accordingly the Contractor hereby agrees to perform a substantial portion of the contract work in this or in any other labor surplus area. "Substantial portion" means the aggregate costs that will be incurred by the Contractor and his first-tier subcontractors and suppliers, on account of manufacturing, production, or services performed in this or any labor surplus area, and the costs that will be incurred by second-tier and lower-tier subcontractors on the construction site will exceed fifty percent(50%) of the price of this contract.

b. Upon request, the Contractor shall furnish to the Contracting Officer data to substantiate that this obligation is satisfied.

c. The Contracting Officer will furnish upon request a list of labor surplus areas.

22. TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER:

1. This provision specifies the procedure for determination of time extensions for unusually severe weather in accordance with the contract clause entitled "Default: (Fixed Price Construction)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

a. The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

b. The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

2. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration(NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY
WORK DAYS BASED ON (5) DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(10)	(9)	(9)	(8)	(7)	(8)	(5)	(5)	(5)	(7)	(6)	(7)

3. Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the contractor's scheduled work day. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph 2, above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather workdays, and issue a modification in accordance with the contract clause entitled "Default (Fixed Price Construction)". (ER 415-1-15) (31 Oct 89)

23. CONTRACTOR-PREPARED NETWORK ANALYSIS SYSTEM

The progress chart to be prepared by the Contractor pursuant to the clause entitled "Schedules for Construction Contracts," shall consist of a network analysis system as described below. In preparing this system, the scheduling of construction is the responsibility of the Contractor. The requirement for the system is included to assure adequate planning and execution of the work and to assist the Contracting Officer in appraising the reasonableness of the proposed schedule and evaluating progress of the work.

23.1 NOT USED.

23.2 The system shall consist of diagrams and accompanying mathematical analyses. The diagrams shall show elements of the project in detail and the entire project in summary.

(1) Diagrams shall show the order and interdependence of activities and the sequence in which the work is to be accomplished as planned by the Contractor. The basic concept of a network

analysis diagram will be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities.

(2) Detailed network activities shown on a detailed or sub-network diagram shall include, in addition to construction activities, the submittal and approval of samples of materials and shop drawings, the procurement of critical materials and equipment, fabrication of special material and equipment and their installation and testing. All activities of the Government that affect progress and contract required dates for completion of all or parts of the work will be shown. The detail of information shall be such that duration times of activities will range from three (3) to thirty (30) days with not over two percent (2%) of the activities exceeding these limits. The activities, which comprise the following, separate buildings and features shall be separately identifiable by coding or use of sub-networks or both:

Building or feature .....

Minimum number of activities .....

The selection and number of activities shall be subject to the Contracting Officer's approval. Detailed networks, when summary networks are also furnished, need not be time scaled but shall be drafted to show a continuous flow from left to right with no arrows from right to left. The following information shall be shown on the diagrams for each activity: preceding and following event numbers, description of the activity, cost, and activity duration.

(3) Summary Network. If the project is of such size that the entire network cannot be readily shown on a single sheet, a summary network diagram shall be provided. The summary network diagram shall consist of a minimum of fifty activities and a maximum of one hundred and fifty activities, and shall be based on and supported by detailed diagrams. Related activities shall be grouped on the network. The critical path shall be plotted generally along the center of the sheet with channels with increasing float placed towards the top or bottom. The summary network shall be time scaled using units of approximately one-half inch equals one week or other suitable scale approved by the Contracting Officer. Weekends and holidays shall be indicated. Where slack exists, the activities shall be shown at the time when they are scheduled to be accomplished.

(4) The mathematical analysis of the network diagram shall include a tabulation of each activity shown on the detailed network diagrams. The following information will be furnished as a minimum for each activity:

(i) predecessor and successor activity identification (numbers shall be selected and assigned so as to permit identification of the activities with bid items):
(ii) activity description;
(iii) estimated duration of activities (the best estimate available at time of computation);
(iv) earliest start date (by calendar date);
(v) earliest finish date (by calendar date);
(vi) scheduled or actual start date (by calendar date);
(vii) scheduled or actual finish date (by calendar date);
(viii) latest start date (by calendar date);
(ix) latest finish date (by calendar date);
(x) slack or float;
(xi) monetary value of activity;
(xii) responsibility for activity (Prime Contractor, subcontractors, suppliers, Government, etc.);
(xiii) manpower required;
(xiv) percentage of activity completed;
(xv) Contractor's earnings based on portion of activity completed; and
(xvi) bid items of which activity is a part.

(5) The program or means used in making the mathematical computation shall be capable of compiling the total value of completed and partially completed activities and subtotals from separate buildings or feature listed in paragraph 19.2(2).

(6) In addition to the tabulation of activities, the computation will include the following data:

(i) identification of activities which are planned to be expedited by use of overtime or double shifts to be worked including Saturdays, Sundays and holidays;

(ii) on-site manpower loading schedule;

(iii) a description of the major items of construction equipment planned for operations of the project. (The description shall include the type, number of units and unit capacities. A schedule showing proposed time equipment will be on the job keyed to activities on which equipment will be used shall be provided); and

(iv) where portions of the work are to be paid by unit costs, the estimated number of units in an activity which was used in developing the total activity cost.

(7) The analysis shall list the activities in sorts or groups as follows:

(i) by the preceding event number from lowest to highest and then in the order of the following event number;

(ii) by the amount of slack, then in order of preceding event number;

(iii) by responsibility in order of earliest allowable start dates; and

(iv) in order of latest allowable start dates, then in order of preceding event numbers, and then in order of succeeding event numbers.

23.3 Submission and approval of the system shall be as follows:

(1) A preliminary network defining the Contractor's planned operations during the first sixty (60) calendar days after notice to proceed will be submitted within ten (10) days. The Contractor's general approach for the balance of the project shall be indicated. Cost of activities expected to be completed or partially completed before submission and approval of the whole schedule should be included.

(2) The complete network analysis consist of the detailed network mathematical analysis (on-site manpower loading schedule, equipment schedule) and network diagrams shall be submitted within forty (40) calendar days after receipt of notice to proceed.

23.4 The Contractor shall participate in a review and evaluation of the proposed network diagrams and analysis by the Contracting Officer. Any revisions necessary as a result of this review shall be resubmitted for approval of the Contracting Officer within ten (10) calendar days after the conference. The approved schedule shall then be the schedule to be used by the Contractor for planning, organizing and directing the work and for reporting progress. If the Contractor thereafter desires to make changes in his method of operating and scheduling, he shall notify the Contracting Officer in writing stating the reasons for the change. If the Contracting Officer considers these changes to be of a major nature he may require the Contractor to revise and submit for approval, without additional cost to the Government, all or the affected portion of the detailed diagrams and mathematical analysis and the summary diagram to show the effect on the entire project. A change may be considered of major nature if the time estimated to be required or actually used for an activity or the logic of sequence of activities is varied from the original plan to a degree that there is a reasonable doubt as to the effect on the contract completion date or dates. Changes, which affect activities with adequate slack time, shall be considered as minor changes, except that an accumulation of minor changes may be considered a major change when their cumulative effect might affect the contract completion date.

23.5 The Contractor shall submit at intervals of fifteen (15) calendar days a report of the actual construction progress by updating the mathematical analyses. Revisions causing changes in the detailed network shall be noted on the summary network, or a revised issue of affected portions of the detailed network furnished. The summary network shall be revised as necessary for the sake of clarity. However, only the initial submission or complete revisions need be time scaled. Subsequent minor revisions need not be time scaled.

23.6 The report shall show the activities or portions of activities completed during the reporting period and their total value as basis for the Contractor's periodic request for payment. Payment made pursuant to the General Provision entitled "Payments to Contractor" will be based on the total value of such activities completed or partially completed after verification by the Contracting Officer. The report will state the percentage of the work actually completed and scheduled as of the report date and the progress along the critical path in terms of days ahead or behind the allowable dates. If the project is behind schedule, progress along other paths with negative slack shall also be reported. The Contractor shall also submit a narrative report with the updated analysis which shall include but not be limited to a description of the problem areas, current and anticipated, delaying factors and their impact, and an explanation of corrective actions taken or proposed.

23.7 Sheet size of diagrams shall be 30 by 42 inches. Each updated copy shall show a date of the latest revision.

23.8 Initial submittal and complete revisions shall be submitted in six (6) copies.

23.9 Periodic reports shall be submitted in four (4) copies.

24. IDENTIFICATION OF EMPLOYEES:

The Contractor shall be responsible for furnishing to each employee and for requiring each employee engaged on the work to display such identification as may be approved and directed by the Contracting Officer. All prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon the release of any employees. When required by the Contracting Officer, the Contractor shall obtain and submit fingerprints of all persons employed or to be employed on the project. (DOD FAR Supplement 52.236-7007)

25. FIELD OFFICE:

NOT USED.

26. EXCLUSION OF PERIODS IN COMPUTING COMPLETION SCHEDULES:

NOT USED.

27. QUANTITY SURVEYS: (APR 1984)

a. Quantity surveys shall be conducted, and the data derived from these surveys shall be used in computing the quantities of work performed and the actual construction completed and in place.

b. The Contractor shall conduct the original and final surveys and survey for any periods for which progress payments are requested. All these surveys shall be conducted under the direction of a representative of the Contracting Officer, unless the Contracting Officer waives this requirement in a specific instance. The Government shall make such computations as are necessary to determine the quantities of work performed or finally in place. The Contractor shall make the computations based on the surveys for any periods for which progress payments are requested.

c. Promptly upon completing a survey, the Contractor shall furnish the originals of all field notes and all other records relating to the survey or to the layout of the work to the Contracting Officer, who shall use them as necessary to determine the amount of progress payments. The Contractor shall retain copies of all such material furnished to the Contracting Officer.
(FAR 52.236-16)

28. TIME EXTENSIONS:

MOT USED.

29. MISPLACED MATERIAL:

NOT USED.

30. SUPERINTENDENT OF SUBCONTRACTORS: (JAN 1965)

a. The Contractor shall be required to furnish the following, in addition to the superintendence required by the Contract Clauses titled, "SUPERINTENDENCE BY THE CONTRACTOR".

(1) If more than 50% and less than 70% of the value of the contract work is subcontracted, one superintendent shall be provided at the site and on the Contractor's payroll to be responsible for coordinating, directing, inspecting and expediting the subcontract work.
(2) If 70% or more of the value of the work is subcontracted, the Contractor shall be required to furnish two such superintendents to be responsible for coordinating, directing, inspecting and expediting the subcontract work.

b. If the Contracting Officer, at any time after 50% of the subcontracted work has been completed, finds that satisfactory progress is being made, he may waive all or part of the above requirement for additional superintendence subject to the right of the Contracting Officer to reinstate such requirement if at anytime during the progress of the remaining work he finds that satisfactory progress is not being made. (DoD FAR Supplement 52.236-7008)

31. PROCEDURES FOR SUBMISSION AND PAYMENT OF ALL CONTRACT PAYMENTS:

In addition to the requirements contained in the Contract Clause entitled "PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS" and to implement the requirements of the Prompt Payment Act Amendments of 1988, P.L. 100-496, the following shall apply to total payments made under this contract:

a. At the time of submission of the progress chart, the Contractor shall submit for approval

by the Contracting Officer or his authorized representative a breakdown of the contract work which shall be to the degree of detail required by the Contracting Officer or his representative to effect reasonable progress payments. The Contracting Officer or his representative shall review this breakdown within 30 calendar days after receipt and either advise the contractor that it is approved or disapproved, and if disapproved the reasons for disapproval. Only after the breakdown is approved shall any payment invoice be accepted from the contractor and any payment made to him. The Contracting Officer can determine if it is in the best interest of the Government to make payment without an approved breakdown, however, in no case shall more than 10% of the contract amount be paid unless the breakdown is approved.

b. The Contractor shall submit his request for payment by submission of a proper invoice to the office or person(s)designated in subparagraph (c). For purposes of payment a "proper invoice" is defined as the following:

(1) An estimate of the work completed in accordance with the approved breakdown indicating the percentage of work of each item and the associated costs.
(2) A properly completed Eng Form 93 and 93a (where required).
(3) All contractual submissions indicated elsewhere in this contract to be submitted with payment, such as updated progress schedules, updated submittal registers, etc.
(4) The following certification executed by a responsible official of the organization authorized to bind the firm. A "responsible official" would be either a corporate officer, partner, or owner, in the case of a sole proprietorship.

I hereby certify, to the best of my knowledge and belief, that --

(a) The amounts requested are only for performance in accordance with the specifications, terms and conditions of the contract;
(b) Payments to subcontractors and suppliers have been made from previous payments received under the contract and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract requirements and the requirements of chapter 39 of Title 31, United States Code; and
(c) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract.
(d) All required prime and subcontractor payrolls have been submitted.

(Name)

(Title)

(Date)

c. The Government shall designate the office or person(s)who shall first receive the invoice submissions and the Contractors hall be so notified at the preconstruction conference. In addition to the designated Project Engineer, the contractor shall at the same time submit one copy of the detailed breakdown and the Eng Form 93 and 93a Form to the Area Engineer.

d. The Government representative shall return any request for payment which is deemed defective within 7 days of receipt and shall specify the defects. If the defect concerns a disagreement as to the amount of work performed and or the amount of the payment being submitted, the Government and the contractor's representative should meet to resolve the differences and reach agreement. Upon agreement, the contractor shall submit a new breakdown and Eng Form 93 (and 93a) and any other submissions requiring correction. These will be incorporated with the previous submittal and will then constitute a proper invoice.

e. If agreement cannot be reached, the Government shall determine the proper amount per Contract Clause, PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS and process the payment accordingly. In this event, a "proper invoice" for Prompt Payment Act purposes will not have been submitted to the Government.

f. The Government shall pay the contractor in accordance with the following time frames:

(1) Progress Payments - From the date a "proper invoice" is received, in accordance with subparagraphs b and d of this clause, the Government will issue a check within 14 calendar days.
(2) Reduction in Retainage Payment. If during the course of the contract, a reduction in retainage payment is required, the Government shall issue a check within 14 calendar days after the approval of the release to the contractor by the Contracting Officer or his authorized representative.
(3) Final Payment. A final payment request shall not be considered valid until the contractor has fulfilled all contract requirements including all administrative items, payrolls, warranties,

etc. and has submitted a release of claims. When the contractor has fulfilled all contract requirements and a "proper invoice" has been submitted, the Government shall issue a check within 14 days from the date of acceptance of the project by the Contracting Officer.

32. VERIFICATION OF SMALL BUSINESS UTILIZATION:

a. This clause is applicable to small business concerns whose contracts exceed $1,000,000.

b. In accordance with the clause at FAR 52.219-8, entitled UTILIZATION OF SMALL BUSINESS CONCERNS AND DISADVANTAGED BUSINESS CONCERNS, in effect on the date of this contract, the Contracting Officer may survey the extent of small and small disadvantaged business utilization under this contract. The Contractor may be required to report to the Contracting Officer statistical data on the number and dollars amounts of subcontracting awards with small businesses and small disadvantaged businesses.

c. As appropriate, the Contracting Officer may require one or more follow-up reports to the initial report.

d. The Contractor agrees to insert this clause in any subcontract that may exceed $1,000,000, including this subparagraph (d).

33. HAZARDOUS MATERIAL IDENTIFICATION & MATERIAL SAFETY DATA:

NOT USED.

34. SAFETY AND HEALTH REQUIREMENTS MANUAL:

If this contract is for construction or dismantling, demolition, or removal of improvements with any Department of Army agency or component, the Contractor shall comply with all pertinent provisions of the latest version of U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, in effect on the date of the solicitation. The latest edition of the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, as referenced in the Accident Prevention Clause of Section I CONTRACT CLAUSES, is dated 3 Sept. 1996.

Before commencing the work, the Contractor shall (1) Submit a written proposal for implementing the Accident Prevention Plan; and (2) Meeting with representatives of the Contracting Officer to discuss and develop a mutual understanding relative to administration of the overall safety program.

35. SPECIAL SCHEDULING REQUIREMENTS FOR MECHANICAL AND ELECTRICAL SYSTEMS:

In reference to the contract clause entitled "PAYMENTS UNDER FIXED PRICE CONSTRUCTION CONTRACTS", see SECTION 01451, TESTING FOR MECHANICAL AND ELECTRICAL SYSTEMS for additional scheduling requirements for such systems.

36. SUBMISSION OF CLAIMS:

The following shall be submitted to the Contracting Officer at the following address: U.S. Army Corps of Engineers, New York District, 26 Federal Plaza, New York, New York 10278-0090:

a. claims referencing or mentioning the Contract Disputes Act of 1978
b. requests for a written decision by the Contracting Officer
c. claims certified in accordance with the Contract Disputes Act of 1978.

No other Government representative is authorized to accept such requests. A copy shall also be provided to the Authorized Representative of the Contracting Officer.

The Contractor shall also provide the Contracting Officer with a copy of any requests for additional time, money or interpretation of contract requirements which were provided to the Authorized Representative of the Contracting Officer and which have not been resolved after 90 days.

If this contract is for construction or dismantling, demolition, or removal of improvements with any Department of Defense agency or component, the Contractor shall comply with all pertinent provisions of the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, September 1996.

37. CONSTRUCTION COLOR BOARD SUBMITTALS:

The contractor shall submit four sets of color boards depicting samples of all finish materials. The color board(finishes sample submittal package) shall include all visible exterior and interior materials and finishes that are a part of the building (and/or structure) or built-in items

provided under this contract. The color boards shall be delivered to each of the addresses listed below in this section. The Contractor shall furnish his color board submittal to the Contracting Officer within 90 days after receipt of the notice to proceed, but more than 30 days prior to ordering finishing materials. The Contractor should obtain approval of his entire color board submission before beginning any work involving final finishes. The Contractor shall use the following format when assembling the color boards:

a. Provide the samples on 8 1/2- x 11-inch board modules with a maximum spread of 25 1/2- x 33-inches for foldouts. Label the modules with the project titles and design them to fit in a standard loose-leaf, three-post binder. The modules should support and anchor all samples. Anchor large or heavy samples
with mechanical fasteners.

b. Organize the submittals in a logical manner to allow a fast review. Write descriptions and explanations clearly. Drawings and photographs must be clear and concise.

c. Organize samples by scheme with a separate scheme for each room or for groups of rooms with the same scheme. Coordinate the schemes by room names and numbers shown on the architectural floor plans and room finish and color schedule. Include floor plans and schedules in modules.

d. Indicate true pattern color and texture for interior material and finish samples. Carpet samples should be large enough to indicate a complete pattern or design, but not less than 3 by 5 inches.

e. Include color/finish pattern and texture for exterior materials and finishes.

f. Provide at least a 6x6-inch square sample where either interior or exterior special finishes, such as architectural concrete or prefinished textured metal panels, are required.

Address:

U.S. Army Corps of Engineers
Northeast Area Office
4 Lexington Street
Box 86
Devens,MA 01432

38. COMPLIANCE WITH POST/BASE REGULATIONS

The site of the work is on a military reservation and all rules and regulations issued by the Commanding Officer covering general safety, security, sanitary requirements, pollution control and traffic regulations, shall be observed by the Contractor. Information regarding these requirements may be obtained by contacting the Contracting officer, who will provide such information or assist in obtaining same from appropriate authorities.

38.1 The Contractor shall install a security gate manned by Contractor's personnel. The gates will be opened only to allow workers and equipment on/off the site and shall be closed and locked at all other times.

38.2 Contractor personnel shall park only in areas authorized by the Contracting Officer.

38.3 Contractor shall furnish an inventory of all hazardous materials at the end of the calendar year.

39. GOVERNMENT RESIDENT MANAGEMENT SYSTEM:

The Government will utilize an in-house NAS/Contract Administration program entitled "Resident Management System" (RMS). The
Contractor shall utilize Government furnished CQC Report Forms. These forms may be in addition to other forms generated by the Contractor's NAS system; however, the Government furnished forms are required to be submitted and kept current. The Contractor shall submit completed forms at the same time and in addition to the schedules required by the clauses of the contract entitled "Schedules for Construction Contracts". RMS forms shall be updated and resubmitted as the work progresses and in accordance with the requirements specified herein.

40. COORDINATION DRAWINGS

The Contractor shall be responsible for and shall prepare drawings appropriate to reorientation of the airplane mock-up from that shown on the contract drawings, as noted on the drawing. The Contractor shall be responsible for coordinating the routing, scheduling and construction of all underground systems so affected. To that end, the Contractor shall prepare, and submit to the Contracting Officer, coordination drawings for underground systems, including all cables, wiring,

piping, liner and structures.

41.SECURITY PERIMETER BARRIERS

Prior to start of construction, the Contractor shall provide precast concrete barriers, tops painted red, to designate the security area perimeter. The barriers will have to be relocated, at various times, to accommodate the various phases of construction. The time and location of such relocation to be coordinated with the Contracting Officer. Note also that there are to be gaps in the continuity to allow for construction traffic.

a. Precast Concrete Barriers

Precast concrete barriers shall be of the New Jersey" configuration, not less than 3 foot 5 inches high, not less than 12 nor more than 20 feet in length and complete with lifting eyes to facilitate placement and relocation. Barriers shall be 3,000-psi compressive (28-day) strength, adequately reinforced for handling and installation.

b. Security Perimeter Red Line

The Contractor shall paint the security perimeter on the concrete barriers. The paint shall be a rubber-base exterior quality paint applied to the entire top surface of the barrier and down 6 inches on each side of the barrier.

END OF SECTION 00800

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA,MATERIALS 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		

ITEM NO.	DESCRIPTION OF ITEM SUBMITTED (Type size, model number, etc.)	MFG. OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. (See Instruction no. 8)	NO OF COPIES	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE CODE	VARIATION (See instruction No. 6)	FOR CE USE CODE
				SPEC. PARA NO.	DRAWING SHEET NO.			

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

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 as 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 a separate form.

5. 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 the 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 i.

9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i 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 I, 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 acknowledge

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)

GENERAL DECISION MA980020 04/17/98 MA20
General Decision Number MA980020

Superseded General Decision No. MA970020

State: Massachusetts

Construction Type:
HEAVY
MARINE

County(ies):
BERKSHIRE HAMPDEN
FRANKLIN HAMPSHIRE

HEAVY CONSTRUCTION PROJECTS; AND MARINE CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	02/13/1998
1	03/13/1998
2	04/10/1998
3	04/17/1998

COUNTY(ies):
BERKSHIRE HAMPDEN
FRANKLIN HAMPSHIRE

BOIL0029A 01/01/1997

	Rates	Fringes
BOILERMAKERS	23.28	12%+8.69

BRMA0001E 12/01/1996

	Rates	Fringes
BRICKLAYERS; CEMENT MASONS; STONE MASONS; MARBLE, TILE & TERRAZO	20.90	7.57

BRMA0001G 12/01/1996

	Rates	Fringes
BERKSHIRE COUNTY		
BRICKLAYERS; CEMENT MASONS; STONE MASONS; MARBLE, TILE & TERRAZZO	18.72	7.12

CARP0056D 08/01/1997

	Rates	Fringes
DIVERS	32.54	10.91

CARP0056I 12/01/1997

	Rates	Fringes
FRANKLIN, HAMPDEN, and HAMPSHIRE COUNTIES		
PILEDRIVERMEN & DIVER TENDERS	21.31	10.91

CARP0056J 12/01/1997

	Rates	Fringes
BERKSHIRE COUNTY		
PILEDRIVERMEN & DIVER TENDERS	20.29	10.91

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* CARP0107G 10/01/1997

	Rates	Fringes
FRANKLIN COUNTY (Erving, Orange, North Orange, and Warwick)		
CARPENTERS	20.70	9.16

CARP0108I 12/01/1997

	Rates	Fringes
BERKSHIRE		
CARPENTERS	17.34	8.01

CARP0108K 12/01/1997

	Rates	Fringes
HAMPDEN; HAMPSHIRE; AND FRANKLIN (Remainder of County)		
CARPENTERS	19.38	8.01

CARP1121A 04/01/1998

	Rates	Fringes
MILLWRIGHTS	23.18	11.51

ELEC0007B 01/01/1998

	Rates	Fringes
HAMPDEN (Except Chester & Holyoke); HAMPSHIRE (Belchertown, Ware)		
ELECTRICIAN	22.40	3%+7.60

ELEC0007C 01/01/1998

	Rates	Fringes
BERKSHIRE; FRANKLIN; HAMPDEN (Chester, Holyoke); HAMPSHIRE (Except Belchertown, Ware)		
ELECTRICIANS	20.78	3%+6.60

ELEC0042B 09/01/1997

	Rates	Fringes
LINE CONSTRUCTION (Includes traffic control, illumination, maintenance, and railroad construction)		
Lineman, Cable Splicer,		

and Dynamite Man	24.15	8.20+6.5%
Heavy Equipment Operator	21.74	8.20+6.5%
Material Man, Tractor Trailer Driver, Equipment Operator	20.53	8.20+6.5%
Driver Groundman	18.11	8.20+6.5%
Groundman	13.28	8.20+6.5%

ENGI0098G 06/01/1997

	Rates	Fringes
POWER EQUIPMENT OPERATORS		
Group 1	22.13	6.65+A
Group 2	21.87	6.65+A
Group 3	21.67	6.65+A
Group 4	21.18	6.65+A
Group 5	18.96	6.65+A
Group 6	18.02	6.65+A
Group 7	16.38	6.65+A
Group 8	23.03	6.65+A
Group 9	17.67	6.65+A
Group 10	23.04	6.65+A
Group 11	22.95	6.65+A
Group 12	23.57	6.65+A

HAZARDOUS WASTE PREMIUM $1.50

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

Group 1: Shovels; crawler and truck cranes; derricks; backhoes; trenching machines; elevating graders; belt type loaders; gradalls; piledrivers; concrete pavers, on-site processing plant (engineer in charge); dragline; clamshell; cableways; shaft hoists; mucking machines; front end loader 5 1/2 cu yd and over; tower cranes; self propelled hydraulic caranes, 10 tons and over; dual pavers; automatic grader, excavator C.M.I. or equal; scrapers towing pan or wagon, tandem dozers or push cats (2 units in tandem); welder using semi-aautomatic welding machine; shotcrete machine; tunnel boring machine; combination backhoe/loader, 3/4 cu yd hoe or over; jet engine dryer; tree shredder; post hole digger; post hole hammer; post extractor; truck mounted concrete pumps with boom; roto-mill

Group 2: Rotary drill with mounted compressor; compressor house, 3 to 6 compressors; rock and earth boring machines, excluding McCarthy and similar drills; grader; front end loaders, 4 yds to 5 1/2 yds; scraper, 21 yds and over (struck load); forklifts 7 ft lift and over or 3 ton capacity and over; sonic hammer console; road planer; cal tracks; ballast regulators; rail anchor machines; swith tampers

Group 3: Bulldozer; push cats; scrapers up to 21 yds, struck load, self propelled or tractor drawn; self powered asphalt paver; front end loaders up to 4 yds; meechanics, welders; well driller; pumpcrete machine; engineer or fireman on high pressure boiler (on job); self loading batch plant (on job); well point operator; electric pumps used in well point system; tireman;

pumps 16 inch or over total discharge; compressors (1 or 2) 900 cu ft and over; powered grease truck; tunnel locomotives and dinkeys; grout pumps; hydraulic jacks (jacking pipe, slip forms, etc.); boom truck, self-propelled hydraulic cranes u to 10 tons; combination backhoe/loader up to 3/4 cu yd hoe

Group 4: Asphalt rollers; self-powered rollers and compactors; tractor without blade drawing sheeps foot roller; rubber tire roller; vibratory roller or other type of compactors including machines for pulverizing and aerating soil

Group 5: Hoists; conveyors; power pavement breaker; self-

propelled material spreader; self-powered concrete finishing machine; two bag mixer with skip; McCAarthy and similar drills; batch plant (not self-loading); bulk cement plant; 3 or more 10 KW light plants; 30 KW or more generator

Group 6: Compressor, 315 cu ft to 900 cu ft, 1 or 2; pumps 4 inches to 16 inches total discharge

Group 7: Compressor up to 315 cu ft; small mixers with skip; oiler; pumps up to 4 inches; grease truck; helper on powered grease trucks; power heaters; welding machines when 3 or more wleding machines are used; A-frame trucks; forklifts up to 7 ft lift and up to 3 ton capacity; hydro boom; power safety boat

Group 8: Truck crane crews

Group 9: Oiler

Group 10: Master mechanic

Group 11: Boom lengths over 184 feet including jib

Group 12: Boom lengths over 225 feet including jib

FOOTNOTE FOR POWER EQUIPMENT OPERATORS

A. Paid Holidays: New year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day, Christmas Day.

IRON0012E 01/01/1998

	Rates	Fringes
BERKSHIRE (Remainder of County)		
IRONWORKERS:		
Structural, Ornamental, Reinforcing, Fence Erector, Machinery Mover, Rigger, Rodman, Stone Derrickman	19.35	9.19
Sheeter	19.60	9.19
Sheeter, Bucker-up	19.475	9.19
Commercial projects valued at $800,00 or less and/or industrial projects valued at $100,000 or less, to exclude demolition work		

(complete razing of structures).
Also excludes pre-engineered
metal buildings and the erection
and installation of structural
steel of any nature 14.51 9.19

IRON0357A 01/04/1998

	Rates	Fringes
BERKSHIRE (Becket, East Otis, Hinsdale, Lee, Monterey, New Marlboro, North Otis, Otis, Peru, Sandisfield, Savoy, Sheffield, Washington, Windsor); FRANKLIN; HAMPDEN; HAMPSHIRE		
IRONWORKERS	20.50	10.79

LABO0022B 09/01/1997

	Rates	Fringes
FRANKLIN (Orange, Warwick)		
LABORERS:		
GROUP 1	18.70	7.45
GROUP 2	18.95	7.45
GROUP 3	19.45	7.45
GROUP 4	19.70	7.45
GROUP 5	19.45	7.45
GROUP 6	20.70	7.45

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; carpenter tenders; cement finisher tenders

GROUP 2: Asphalt raker; fence and guard rail erector; laser beam operator; mason tenmder; pipelayer; pneumatic drill operator; pneumatic tool operator; wagon drill operator

GROUP 3: Air track operator; block paver; rammer; curb setter

GROUP 4: Blaster; powderman

GROUP 5: Precast floor and roof, plank erector

GROUP 6: Asbestos Abatement, Toxic and Hazardous waste laborers

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LABO0596B 09/01/1997

	Rates	Fringes
BERKSHIRE; FRANKLIN (Except Orange and Warrick); HAMPDEN; HAMPSHIRE		
LABORERS:		
Group 1	16.35	7.45
Group 2	16.60	7.45
Group 3	17.10	7.45
Group 4	17.35	7.45

Group 5	12.35	7.45
Group 6	18.35	7.45

LABORERS CLASSIFICATIONS

Grup 1: Carpenter tenders, cement finisher tenders, laborers, wrecking laborers

Group 2: Asphalt rakers, fence and guard rail erectors, laser beam operatro, mason tender, pipelayer, pneumatic drill operator, pneumatic tool operator, wagon drill operator

Group 3: Air track operator, block pavers, rammers, curb setters

Group 4: Blasters, powdermen

Group 5: Flaggers

Group 6: Asbestos abatement, toxic and Hazardous waste laborers

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LABO1421B 12/01/1997

	Rates	Fringes
WRECKING LABORERS:		
Yardmen Laborer (Salvage Yard only)	16.35	7.45
Yardmen Burners, Sawyers	19.45	7.45
Wrecking Laborers	20.35	7.45
Adzeman	20.35	7.45
Burners, Jackhammers	20.60	7.45
Small Front Loaders on Tracks and Bobcat Operators	20.85	7.45
Asbestos Removers	22.35	7.45

PAIN0035J 01/01/1998

	Rates	Fringes
PAINTERS:		
NEW CONSTRUCTION:		
Brush, Taper	18.33	6.37
Spray, Sandblast	19.33	6.37
REPAINT:		
Brush, Taper	15.65	6.37
Spray, Sandblast	16.35	6.37
Bridge	30.01	6.37

PAIN0035R 01/01/1998

	Rates	Fringes
SIGN PAINTERS	20.79	5.77

PLUM0004D 03/01/1998

	Rates	Fringes
FRANKLIN (Orange)		
PLUMBERS & STEAMFITTERS	22.16	9.10

PLUM0104A 02/01/1998

	Rates	Fringes
BERKSHIRE (Becket, Otis, Sandisfield); FRANKLIN (Except Monroe, Orange, Towe, and the Western part of Charlemont); HAMPDEN; HAMPSHIRE		
PLUMBERS & PIPEFITTERS	22.16	9.50+A

FOOTNOTE:
A. Two paid holidays, Independence Day and Labor Day, provided the employee has been employed seven days prior to the holiday by the same employer

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PLUM0151A 07/01/1997

	Rates	Fringes
BERKSHIRE (Except Otis, Becket, Sandisfield); FRANKLIN (Monroe, Towe, and the Western part of Charlemont)		
PLUMBERS & STEAMFITTERS	20.50	8.06

TEAM0379A 12/01/1997

	Rates	Fringes
TRUCK DRIVERS:		
Group 1	20.43	7.96+A+B
Group 2	20.60	7.96+A+B
Group 3	20.67	7.96+A+B
Group 4	20.79	7.96+A+B
Group 5	20.89	7.96+A+B
Group 6	21.18	7.96+A+B
Group 7	21.47	7.96+A+B

POWER TRUCKS $.25 DIFFERENTIAL BY AXLE
TUNNEL WORK (UNDERGROUND ONLY) $.40 DIFFERENTIAL BY AXLE

TRUCK DRIVERS CLASSIFICATIONS

Group 1: Station wagons; panel trucks; and pickup trucks
Group 2: Two axle equipment; & forklift operator
Group 3: Three axle equipment and tireman
Group 4: Four and Five Axle equipment
Group 5: Specialized earth moving equipment under 35 tons other than conventional type trucks; low bed; vachual; mechanics, paving restoration equipment
Group 6: Specialized earth moving equipment over 35 tons
Group 7: Trailers for earth moving equipment (double hookup)

FOOTNOTES:
A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day, and

Christmas Day
B. PAID VACATION: Employees with 4 months to 1 year of

service receive 1/2 day's pay per month; 1 week vacation for 1 - 5 years of service; 2 weeks vacation for 5 - 10 years of service; and 3 weeks vacation for more than 10 years of service

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(v)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations

Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

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SECTION 01000

BULLETIN BOARD AND PROJECT SAFETY SIGN

1. SCOPE

This section covers a project bulletin board and a project safety sign, complete.

2. GENERAL

Immediately upon beginning of work under this contract, the Contractor shall accomplish the work covered under this section of the specifications. Locations of the bulletin board and the project safety sign shall be as determined by the Contracting Officer.

3. BULLETIN BOARD

Immediately upon beginning of work under this contract, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 36 x 48 inches in size, for displaying the Equal Employment Opportunity Poster, a copy of the wage decision contained in the contract, Wage Rate Information Poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the site of work in a conspicuous place easily accessible to all employees as approved by the Contracting Officer. Legible copies of the aforementioned data shall be displayed until work under the contract is complete. Upon completion of work under this contract the bulletin board shall be removed by and remain the property of the Contractor.

4. PROJECT SAFETY SIGN

The Contractor shall furnish and erect a project safety sign at the Contractor's field office. The safety sign shall be located in a conspicuous place easily within view of all employees and visitors as approved by the Contracting Officer. Details of construction shall be as shown on the drawings attached at the end of this section. The sign shall be constructed of 3/4 inch thick, grade A-C, exterior type plywood. The sign shall receive two coats of an approved white, semigloss, exterior type enamel. Lettering shall be as shown on the drawings and shall be semigloss, exterior type enamel of the colors noted on the drawings. The Contractor shall furnish and apply a red decal of the Corps of Engineers' Castle, or may use a stencil in lieu of a decal provided the dimensions are the same. The decal, if used, shall receive a thin coat of clear spar varnish after application. If a stencil is used, the castle shall be painted with an approved red, semigloss, exterior type, enamel. The Contractor shall furnish a sufficient number of sign numbers to cover the length of the contract period and to keep both numbered spaces up to date. The Contractor shall keep the safety sign current by posting the numbers daily in both slots (line 5 and 6 of sign). Numbers shall be red and the size indicated on the drawing and shall be of a weatherproof material. Upon completion of work under this contract, the project safety sign shall be removed from the Government-controlled lane and remain the property of the Contractor.

5. PAYMENT

No separate payment will be made for the work covered under this section of the specifications and all costs in connection therewith will be considered as a subsidiary obligation of the Contractor, covered by the contract prices in this contract.

END OF SECTION 01000

SECTION 01090

SOURCES FOR REFERENCE PUBLICATIONS

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the sponsoring organization, e.g. UL 1 (1993; Rev thru Jan 1995) Flexible Metal Conduit. However, when the sponsoring organization has not assigned a number to a document, an identifying number has been assigned for convenience, e.g. UL's unnumbered 1995 edition of their Building Materials Directory is identified as UL-01 (1995) Building Materials Directory. The sponsoring organization number (UL 1) can be distinguished from an assigned identifying number (UL-1) by the dash mark (-).

1.2 ORDERING INFORMATION

The addresses of the organizations whose publications are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the sponsoring organization should be ordered from the source by title rather than by number.

AGRICULTURAL MARKETING SERVICE (AMS)
Seed Regulatory and Testing Branch
USDA, AMS, LS Div.
Bldg. 506, BARC-East
Soil Conservation Rd.
Beltsville, MD 20705
Ph: 301-504-9430

ALUMINUM ASSOCIATION (AA)
Pubs Department
P.O. Box 753
Waldorf, MD 20601
Ph: 301-645-0756
Fax: 301-843-0159

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1540 East Dundee Rd., Suite 310
Palatine, IL 60067-8321
Ph: 708-202-1350
Fax: 708-202-1480

AMERICAN ASSOCIATION OF NURSERYMEN (AAN)
1250 I St., NW, Suite 500
Washington, DC 20005
Ph: 202-789-2900
FAX: 202-789-1893

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
444 N. Capital St., NW, Suite 249
Washington, DC 20001
Ph: 202-624-5800
Fax: 202-624-5806

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABEMA)
1200 19th St., Suite 300
Washington, DC 20036
Ph: 202-429-5155

ACI INTERNATIONAL (ACI)
P.O. Box 19150
Detroit, MI 48219-0150
Ph: 313-532-2600
Fax: 313-533-4747

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)
1330 Camper Meadow Dr.
Cincinnati, OH 45240
Ph: 513-742-2020
Fax: 513-742-3355

AMERICAN FOREST & PAPER ASSOCIATION (AFPA)
1111 Nineteenth St. NW, Suite 800
Washington, DC 20036
Ph: 202-463-2700
Fax: 202-463-2785

AMERICAN HARDBOARD ASSOCIATION (AHA)
1210 W. Northwest Highway
Palatine, IL 60067
Ph: 708-934-8800
Fax: 708-934-8803

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One E. Wacker Dr., Suite 3100
Chicago, IL 60601-2001
Ph: 312-670-2400
Fax: 312-670-5403

AMERICAN IRON AND STEEL INSTITUTE (AISI)
1101 Seventeenth St., NW, Suite 1300
Washington, DC 20036
Ph: 202-452-7100
Fax: 202-463-6573

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
11 West 42nd St
New York, NY 10036
Ph: 212-642-4900
Fax: 212-302-1286

AMERICAN PETROLEUM INSTITUTE (API)
1220 L St., NW
Washington, DC 20005
Ph: 202-682-8375
Fax: 202-962-4776

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)
1711 Arlingate Lane
P.O. Box 28518
Columbus, OH 43228-0518
Ph: 800-222-2768
Fax: 614-274-6899

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
1916 Race St.
Philadelphia, PA 19103
Ph: 215-299-5585
Fax: 215-977-9679

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
22 Law Dr., Box 2300
Fairfield, NJ 07007-2300
Ph: 800-843-2763
Fax: 201-882-1717

AMERICAN WATER WORKS ASSOCIATION
(AWWA)
6666 West Quincy
Denver, CO 80235
Ph: 800-926-7337
Fax: 303-795-1989

AMERICAN WELDING SOCIETY (AWS)
P.O. Box 351040
Miami, FL 33135
Ph: 800-443-9353
Fax: 305-443-7559

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)
P.O. Box 286
Woodstock, MD 21163-0286
Ph: 410-465-3169
Fax: 410-465-3195

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
355 Lexington Ave.
New York, NY 10017
Ph: 212-661-4261
FAX: 212-370-9047

CODE OF FEDERAL REGULATIONS (CFR)
Order from:
Government Printing Office
Washington, DC 20402
Ph: 202-783-3238
Fax: 202-275-7703

COMMERCIAL ITEM DESCRIPTIONS (CID)
Order from:
Standardization Documents Order Desk
Bldg 4D
700 Robbins Av
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-2978

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)
933 No. Plum Grove Rd.
Schaumburg, IL 60173-4758
Ph: 708-517-1200
Fax: 708-517-1206

CORPS OF ENGINEERS (COE)
Order from:
U.S. Army Engineer Waterways Experiment Station
ATTN: Technical Report Distribution Section, Services Branch, TIC
3909 Halls Ferry Rd.
Vicksburg, MS 39180-6199
Ph: 601-634-2355
Fax: 601-634-2506

DEPARTMENT OF COMMERCE (DOC)
Order From:
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Ph: 703-487-4650
Fax: 703-321-8547

DOOR AND HARDWARE INSTITUTE (DHI)
14170 Newbrook Dr.
Chantilly, VA 22021-2223
Ph: 703-222-2010
Fax: 703-222-2410

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)
245 Riverchase Parkway E
Suite O
Birmingham, AL 35244
Ph: 205-988-9870

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)
1151 Boston-Providence Turnpike
P.O. Box 9102
Norwood, MA 02062-9957
Ph: 617-762-4300
Fax: 617-762-9375
FEDERAL SPECIFICATIONS (FS)
Order from:
Standardization Documents Order Desk
Bldg 4D
700 Robbins Av
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-2978

FEDERAL STANDARDS (FED-STD)
Order from:
Standardization Documents Order Desk
Bldg 4D
700 Robbins Av
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-2978

FEDERAL TEST METHOD STANDARDS (FTM-STD)
Order from:
Standardization Documents Order Desk
Bldg 4D
700 Robbins Av
Philadelphia, PA 19111-5094

Ph: 215-697-2179
Fax: 215-697-2978

FLAT GLASS MARKETING ASSOCIATION (FGMA)
White Lakes Professional Bldg.
3310 Harrison St.
Topeka, KS 66611-2279
Ph: 913-266-7013
Fax: 913-266-0272

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Ln, P. O. Box 1331
Piscataway, NJ 08855-1331
Ph: 800-678-4333
Fax: 908-981-9667

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)
P.O. Box 440
South Yarmouth, MA 02664
Ph: 508-394-4424
Fax: 508-394-1194
Order From:
American National Standards Institute
Customer Service Dept.
1430 Broadway
New York, NY 10018
Ph: 212-642-4900
Fax: 212-302-1286

IRON AND STEEL SOCIETY (ISS)
410 Commonwealth Dr.
Warrendale, PA 15086-7512
Ph: 412-776-9460
Fax: 412-776-0430

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)
127 Park St., NE
Vienna, VA 22180
Ph: 203-281-6613

MILITARY HANDBOOKS (MIL-HDBK)
Order from:
Standardization Documents Order Desk
Bldg 4D
700 Robbins AV
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-2978

MILITARY SPECIFICATIONS (MS)
Order from:
Standardization Documents Order Desk
Building 4, Section D
700 Robbins Ave.
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-2978

MILITARY STANDARDS (MIL-STD)
Order from:
Standardization Documents Order Desk
Building 4, Section D
700 Robbins Ave.
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-2978

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)
11 So. LaSalle St., Suite 1400
Chicago, IL 60603
Ph: 312-201-0101
FAX: 312-201-0214

NACE INTERNATIONAL (NACE)
P.O. Box 218340
Houston, TX 77218-8340
Ph: 713-492-0535
Fax: 713-492-8254

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
2101 L St., NW, Suite 300
Washington, DC 20037-1526
Ph: 202-457-8474
Fax: 202-457-8473

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
P.O. Box 9146
Quincy, MA 02269

Ph: 800-344-3555
Fax: 617-984-7057

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)
P.O. Box 87A
Cumberland Center, ME 04021
Ph: 207-829-6901
Fax: 207-829-4293

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)
900 Spring Street
Silver Spring, MD 20910
Ph: 301-587-1400
Fax: 301-585-4219

NSF INTERNATIONAL (NSF)
3475 Plymouth Rd.
P.O. Box 130140
Ann Arbor, MI 48113-0140
Ph: 313-769-8010
Fax: 313-769-0109

NEW YORK STATE DEPARTMENT OF TRANSPORTATION (NYSDOT)
PLANS & PUBLICATIONS SALES
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Albany, NY 12232-0204
Ph: 518-457-2124

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
P.O. Box 221230
Chantilly, VA 22022
Ph: 703-803-2980
Fax: 703-803-3732

SOUTHERN PINE INSPECTION BUREAU (SPIB)
4709 Scenic Highway
Pensacola, FL 32504-9094
Ph: 904-434-2611
Fax: 904-433-5594

STEEL DECK INSTITUTE (SDI)
P.O. Box 9506
Canton, OH 44711
Ph: 216-493-7886
Fax: 216-493-7886 (Fax Mach distinguishes bet voice and computer)

STEEL DOOR INSTITUTE (SDOI)
30200 Detroit Rd.
Cleveland, OH 44145-1967
Ph: 216-899-0010
Fax: 216-892-1404

STEEL JOIST INSTITUTE (SJI)
1205 Forty-eighth Ave. No., Suite A
Myrtle Beach, SC 29577-5424
Ph: 803-449-0487
Fax: 803-449-1343

STEEL STRUCTURES PAINTING COUNCIL (SSPC)
4516 Henry St., Suite 301
Pittsburgh, PA 15213-3728
Ph: 412-687-1113
Fax: 412-687-1153

STEEL WINDOW INSTITUTE (SWI)
1300 Sumner Ave.
Cleveland, OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105

TRUSS PLATE INSTITUTE (TPI)
583 D'Onofrio Dr., Suite 200
Madison, WI 53719
Ph: 608-833-5900
Fax: 608-833-4360

UNDERWRITERS LABORATORIES
(UL)
333 Pfingsten Rd.
Northbrook, IL 60062
Ph: 708-272-8800, ext 42612
Fax: 708-272-8129

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)
2655 Villa Creek Dr., Suite 155
Dallas, TX 75234
Ph: 214-243-3902
Fax: 214-243-3907

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)
P.O. Box 23145
Portland, OR 97281
Ph: 503-639-0651
Fax: 503-684-8928

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)
Yeon Bldg.
522 SW 5th Ave.
Portland, OR 97204-2122

Ph: 503-224-3930
Fax: 503-224-3934

WOOD MOULDING AND MILLWORK PRODUCERS ASSOCIATION (WMMPA)
P.O. Box 25278
Portland, OR 97225
Ph: 503-292-9288

END OF SECTION 01090

SECTION 01300

SUBMITTAL DESCRIPTIONS

1.1 SUBMITTALS

The submittals described below are those required and further described in other sections of the specifications. Other requirements pertaining to submittals are included in the SPECIAL CLAUSES and Section 01305 SUBMITTAL PROCEDURES. Submittals required by the CONTRACT CLAUSES and other nontechnical parts of the contract are not included in this section.

SD-01 Data

Submittals which provide calculations, descriptions, or documentation regarding the work.

SD-04 Drawings

Submittals which graphically show relationship of various components of the work, schematic diagrams of systems, details of fabrication, layouts of particular elements, connections, and other relational aspects of the work.

SD-06 Instructions

Preprinted material describing installation of a product, system or material, including special notices and material safety data sheets, if any, concerning impedances, hazards, and safety precautions.

SD-07 Schedules

Tabular lists showing location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.

SD-08 Statements

A document, required of the Contractor, or through the Contractor, from a supplier, installer, manufacturer, or other lower tier Contractor, the purpose of which is to confirm the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other verifications of quality.

SD-09 Reports

Reports of inspections or tests, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used shall be identified and test results shall be recorded.

SD-13 Certificates

Statement signed by an official authorized to certify on behalf of the manufacturer of a product, system or material, attesting that the product, system or material meets specified requirements. The statement must be dated after the award of this contract, must state the Contractor's name and address, must name the project and location, and must list the specific requirements which are being certified.

SD-14 Samples

Samples, including both fabricated and unfabricated physical examples of materials, products, and units of work as complete units or as portions of units of work.

SD-18 Records

Documentation to record compliance with technical or administrative requirements.

SD-19 Operation and Maintenance Manuals

Data which forms a part of an operation and maintenance manual.

END OF SECTION 01300

SECTION C-01305

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.1.1 Government Approved

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.1.2 Information Only

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.1.3 Review of Construction Contractor Submittals

All submittals for Government Approval will also contain one of the following designations,"D1", "D2", "D3", or "X", in the remarks column of Submittal Register Part B. All submittals For Information Only will also contain a "C" or "E" in the remarks column.

D1 - A Contractor design in which the project designer maintains final and total responsibility for the design
D2 - A Contractor design in which the design liability is passed to the Contractor
D3 - Fire Protection/Life Safety submittals (Excluding sprinkler design)
X - Any other submittal for which Government Approval is desired
C - Information for CEORLCD purposes
E - Information for CEORLED purposes

1.2 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the CQC requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.3 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.4 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall submit all items listed on the Submittal Register (Parts A and B) or specified in the other sections of these specifications. The Contracting Officer may request submittals in addition to those listed when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same used in the contract drawings. Submittals shall be made in the respective number of copies and to the respective addresses set forth below. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) representative and each item shall be stamped, signed, and dated by the CQC representative indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturers Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

3.2 SUBMITTAL REGISTER

At the end of this Section is one set of Submittal Registers (Parts A and B) listing each item of equipment and material for which submittals are required by the specifications. Columns "a" thru "d" have been completed by the Government. The Contractor shall complete columns "f" thru "m", and return 3 completed copies to the Contracting Officer within 30 calendar days after Notice to Proceed, for approval. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. This register and the progress schedules shall be coordinated. Copies of updated or corrected listing shall be submitted to the Contracting Officer at least every 60 days in the quantity specified.

3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 30 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delays damages or time extensions will be allowed for time lost in late submittals.

3.4 TRANSMITTAL FORM (ENG Form 4025)

The sample transmittal form (ENG Form 4025), attached to this section, shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care will be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3.5 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

3.5.1 Procedures

The Contractor shall submit to the Contracting Officer eight copies of all submittals of items requiring shop inspection and six copies of all other submittals as called for under the various headings of these specifications

a. The eight copies to be submitted by the Contractor for review and approval shall be sent directly as follows:

U.S. Army Corps of Engineers
Northeast Area Office
4 Lexington Street
Box 86
Devens, MA 01432

3.5.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

3.6 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

3.7 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received review by assigning an action code and signature of approving official. Three copies of the submittal will be retained by the Contracting Officer and three copies of the submittal will be returned to the Contractor.

3.8 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications and will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work. This does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

3.9 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

_____
CONTRACTOR
(Firm Name)
_____Approved
_____ Approved with corrections as noted on submittal data and/or attached sheets(s).
SIGNATURE: _____
TITLE: _____
DATE: _____

END OF SECTION 01305

SUBMITTAL REGISTER

SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1) 01440	Contractor Quality Control Plan	3.2	GA			
1a	Quality Control Checkout/Test	3.9	GA			
1b	Test Plan	2.0	GA			
2) 01500	Site Plan	1.1.1	FIO			
3) 01560	SD-08 Statements	1.4				
4)	Environmental Protection Plan	1.5.1	GA			
5)	Health and Safety Plan	1.5.3	GA			
5a	Water Pollution Inspection and Maintenance Report	3.3	GA			
6)	Solid and Sanitary Waste Disposal	3.4	FIO			
6a)	Hazardous and Oily Waste Disposal	3.5	FIO			
7) 01800	E,O,M and R Manuals (Draft Outline)	3.1	GA			
8) 02110	SD-18 Records	1.3				
9)	Materials Other Than Salable Lumber	3.3.1	FIO			
10) 02210	SD-08 Statements	1.3				
11)	Field Testing Control	3.10	FIO			
12) 02210	SD-09 Reports	1.3				
13)	Field Testing Control	3.10	FIO			
14)	Satisfactory Materials	2.1	FIO			
15) 02221	SD-09 Reports	1.3				
16)	Field Density Tests	3.14	FIO			
17)	Test Backfill Material	3.14.12	FIO			

* Navy Notes:
Approved by:
G: Contracting Officer
Blank: CQC Manager

* NASA Notes:
Approved by:
Blank: Contracting Officer

* Army Notes:
Classification:
GA: Gov't Approval
FIO: For Information Only

SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								X 1)
								X 1a)
								X 1b)
								C 2)
								3)
								X 4)
								X 5)
								X 5a)
								C 6)
								C 6a)
								X 7)
								8)
								C 9)
								10)
								C 11)
								12)
								C 13)
								C 14)
								15)
								C 16)
								C 17)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
A: Approved RR: Disapproved; Revise and Resubmit
(Others may be prescribed by the Transmittal Form)

SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
18) 02222	SD-09 Reports	1.3				
19)	Testing of Backfill Materials	3.4.2	FIO			
20) 02225	SD-08 Statements	1.2				
21)	Earthwork	1.5	GA			
22) 02225	SD-09 Reports	1.2				
23)	Testing	3.7	GA			
24) 02225	SD-13 Certificates	1.2				
25)	Testing	3.7	GA			
26) 02225	SD-18 Records	1.2				
27)	Earthwork	1.5	GA			
28) 02233	SD-09 Reports	1.3				
29)	Copies of Field Test Results	1.6.2	FIO			
30) 02511	SD-09 Reports	1.2				
31)	Field Quality Control	3.8	FIO			
32) 02511	SD-18 Records	1.2				
33)	Concrete	2.1	FIO			
34) 02513	SD-01 Data	1.4				
35)	Job Mix Formula	1.7	GA			
36)	Aggregates	1.3	GA			

* Navy Notes:
Approved by:
G: Contracting Officer
Blank: CQC Manager

* NASA Notes:
Approved by:
Blank: Contracting Officer

* Army Notes:
Classification:
GA: Gov't Approval
FIO: For Information Only

SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								18)
								C 19)
								20)
								X 21)
								22)
								X 23)
								24)
								X 25)
								26)
								X 27)
								28)
								C 29)
								30)
								C 31)
								32)
								C 33)
								34)
								X 35)
								X 36)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
A: Approved RR: Disapproved; Revise and Resubmit
(Others may be prescribed by the Transmittal Form)

SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
37)	Bituminous Material	1.3	GA			
38) 02513	SD-09 Reports	1.4				
39)	Test	3.1	FIO			
40) 02513	SD-13 Certificates	1.4				
41)	Bituminous Material	1.3	FIO			
42) 02660	SD-04 Drawings	1.3				
42a)	Burn Pit Water Piping	2.1	GA			
43) 02660	SD-06 Instructions	1.3	FIO			
43a)	Installation	1.2	FIO			
44) 02660	SD-08 Statements	1.3				
45)	Satisfactory Installation	3.2	GA			
46) 02660	SD-09 Reports					
47)	Bacterial Examination	3.3	GA			
48) 02699	SD-04 Drawings	1.3				
49)	Valve Manholes, Pipe and Equipment	2.1	FIO			
50)	SD-19 Operation and Maintenance Manual	1.3				
51)	Valve Manholes, Pipe and Equipment	2.1	FIO			
52) 02710	SD-13 Certificates	1.2				
53)	Filter Fabric	2.2	FIO			
54)	Pipe for Subdrains	2.1	FIO			

* Navy Notes:
Approved by:
G: Contracting Officer
Blank: CQC Manager

* NASA Notes:
Approved by:
Blank: Contracting Officer

* Army Notes:
Classification:
GA: Gov't Approval
FIO: For Information Only

SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								X 37)
								38)
								C 39)
								40)
								C 41)
								42)
								C 42a)
								43)
								X 43a)
								44)
								X 45)
								46)
								X 47)
								48)
								C 49)
								50)
								C 51)
								52)
								C 53)
								C 54)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
A: Approved RR: Disapproved; Revise and Resubmit
(Others may be prescribed by the Transmittal Form)

SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE

(a)	(b)	(c)	(d)	(e)	(f)	(g)
55) 02720	SD-06 Instructions	1.2				
56)	Placing Pipe	3.3	FIO			
57) 02720	SD-13 Certificates	1.2				
58)	Determination of Density	3.5.5	FIO			
59) 02730	SD-13 Certificates	1.3				
60)	Portland Cement	2.7.1	FIO			
61) 02732	SD-09 Reports	1.2				
62)	Hydrostatic Tests	3.2				
63) 02775	SD-01 Data	1.4				
64)	Manufacturer's Catalog	2.1	FIO			
65)	Fittings, Joints and Couplings	2.1.1.B&C	GA			
66) 02775	SD-06 Instructions	1.4				
67)	Manufacturer's Instructions	3.3	GA			
68)	Pipe Installation	3.3	GA			
69) 02775	SD-13 Certificates	1.4				
70)	Certificates of Compliance		GA			
71)	Pipe and Fittings	2.1	GA			
72)	Pipe Joint Material	2.1	GA			
72a)	Welders	1.5	GA			
73) 02775	SD-19 O & M Manuals	1.4				
74)	O & M Manual	1.4	GA			
75) 02776	SD-01 Data	1.2				

* Navy Notes:
  Approved by:
  G: Contracting Officer
  Blank: CQC Manager

* NASA Notes:
  Approved by:
  Blank: Contracting Officer

* Army Notes:
  Classification:
  GA: Gov't Approval
  FIO: For Information Only

SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								55)
								C 56)
								57)
								C 58)
								59)
								C 60)
								61)
								C 62)
								63)
								C 64)
								X 65)
								66)
								X 67)
								X 68)
								69)
								X 70)
								X 71)
								X 72)
								X 72a)
								73)
								X 74)
								75)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
A: Approved RR: Disapproved; Revise and Resubmit
(Others may be prescribed by the Transmittal Form)

SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
76)	Manufacturer's Catalog	2	FIO			
77)	Drainage Net	2.1.2	GA			
78)	Geotextile Filter Fabric	2.1.3	GA			
79)	Splicing Cement	2.2	GA			
80)	Penetration Sleeves	2.3	GA			
81) 02776	SD-04 Drawings	1.2				
82)	Liner System	1.2	GA			
83) 02776	SD-06 Instructions	1.2				
84)	Manufacturer's Instructions	1.3	FIO			
85)	Liner	3.4.1	GA			
86)	Seaming Adhesive	3.4.1	GA			
87)	Application	3.4.1	GA			
88)	Protection	3.4.1	GA			
89)	Corrections	3.4.1	GA			
90) 02776	SD-08 Quality Control	1.2				
91)	Manufacturer's Installation Inst.	3.8	FIO			
92)	Procedures & Requirements	3.4	FIO			
93) 02776	SD-13 Certificates	1.2				
94)	Liner	3.8.3	GA			

* Navy Notes:
Approved by:
G: Contracting Officer
Blank: CQC Manager

* NASA Notes:
Approved by:
Blank: Contracting Officer

* Army Notes:
Classification:
GA: Gov't Approval
FIO: For Information Only

SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION			CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								C 76)
								X 77)
								X 78)
								X 79)
								X 80)
								81)
								X 82)
								83)
								C 84)
								X 85)
								X 86)
								X 87)
								X 88)
								X 89)
								90)
								C 91)
								C 92)
								93)
								X 94)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
A: Approved RR: Disapproved; Revise and Resubmit
(Others may be prescribed by the Transmittal Form)

SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION	SD NO. & TYPE OF SUBMITTAL -	SPEC PARA NO.	CLASSIF/ APPR BY	GOVT OR A/E REVR	TRANS CONTL	PLAN'D SUBMIT

NO.	MATL OR PRODUCT		CO *		NO.	DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
95)	Filter Fabric	3.8.2	GA			
96) 02831	SD-04 Drawings	1.2				
97)	Chain Link Fence	2.1	F10			
97a)	SD-13 Certificate	2.1	F10			
97b)	Chain Link Fence	2.1	GA			
98) 02935	SD-01 Data	1.2				
99)	Manufacturer's Literature	2.1.4/2.1.7	F10			
100) 02935	SD-07 Schedules	1.2				
101)	Equipment List	3.3.2	FIO			
102) 02935	SD-08 Statements	1.2				
103)	Delivery	1.4	FIO			
104)	Application of Pesticide	3.5	FIO			
105) 02935	SD-13 Certificates	1.2				
106)	Certificates of Compliance	1.2	FIO			
107)	Seed	2.1.1	FIO			
108)	Asphalt Adhesive	2.1.5	FIO			
109)	Pesticide	2.1.7	FIO			
110)	Topsoil	3.2.4	FIO			
111) 03100	SD-01 Data	1.2				
112)	Design	1.3	FIO			
113)	Concrete Formwork	2.1	FIO			
114) 03100	SD-04 Drawings	1.2				

* Navy Notes:
  Approved by:
  G: Contracting Officer
  Blank: CQC Manager

* NASA Notes:
  Approved by:
  Blank: Contracting Officer

* Army Notes:
  Classification:
  GA: Gov't Approval
  FIO: For Information Only

SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								X 95)
								96)
								C 97)
								C 97a)
								X 97b)
								98)
								C 99)
								100)
								C 101)
								102)
								C 103)
								C 104)
								105)
								C 106)
								C 107)
								C 108)
								C 109)
								C 110)
								111)
								C 112)
								C 113)
								114)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
A: Approved RR: Disapproved; Revise and Resubmit
(Others may be prescribed by the Transmittal Form)

SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
115)	Concrete Formwork	1.3	FIO			
116) 03100	SD-06 Instructions	1.2				
117)	Form Release Agent	2.1.4	FIO			
118) 03100	SD-13 Certificates	1.2				
119)	Fiber Voids	2.1.5	FIO			
120) 03100	SD-14 Samples	1.2				
121)	Fiber Voids	2.1.5	FIO			
122) 03200	SD-04 Drawings	1.2				
123)	Concrete Reinforcement System	3.1	GA			
124) 03200	SD-08 Statements	1.2				
125)	Qualifications	1.3	FIO			
126) 03200	SD-13 Certificates	1.2				
127)	Reinforcing Steel	2.1,2.2	FIO			
128) 03250	SD-01 Data	1.2				
129)	Expansion Joint	2.1	FIO			
130)	Sealant	2.2.1	FIO			
131)	Waterstops	2.3.1	FIO			
132) 03250	SD-06 Instructions	1.2				
133)	Expansion Joint	3.1.2	FIO			
134)	Sealant	3.1.3	FIO			

* Navy Notes:
Approved by:
G: Contracting Officer
Blank: CQC Manager

* NASA Notes:
Approved by:
Blank: Contracting Officer

* Army Notes:
Classification:
GA: Gov't Approval
FIO: For Information Only

SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								C 115)
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								C 129)
								C 130)
								C 131)
								132)
								C 133)
								C 134)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
A: Approved RR: Disapproved; Revise and Resubmit
(Others may be prescribed by the Transmittal Form)

SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
135)	Waterstops	3.2.1	FIO			
136) 03300	SD-08 Statements	1.2				
137)	Proportions of Mix	1.4	GA			
138) 03300	SD-09 Reports	1.2				
139)	Sampling and Testing	3.4	FIO			
140) 03300	SD-13 Certificates	1.2				
141)	Cementitious Materials	2.2	FIO			
142) 04200	SD-01 Data	1.2				
143)	Concrete Brick	2.3	FIO			
144)	Concrete Masonry Units	2.4	FIO			
145) 04200	SD-04 Drawings	1.2				
146)	Masonry Work	3.2	FIO			
147) 04200	SD-08 Statements	1.2				
148)	Cold Weather Installation	3.1.2	FIO			
149) 04200	SD-09 Reports	1.2				
150)	Field Test Mortar	3.26.1	FIO			
151)	Field Test Grout	3.26.2	FIO			
152) 04200	SD-13 Certificates	1.2				

* Navy Notes:
Approved by:
G: Contracting Officer
Blank: CQC Manager

* NASA Notes:
Approved by:
Blank: Contracting Officer

* Army Notes:
Classification:
GA: Gov't Approval
FIO: For Information Only

SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								C 135)
								136)
								X 137)
								138)
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								C 150)
								C 151)
								152)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
A: Approved RR: Disapproved; Revise and Resubmit
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SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
153)	Concrete Brick	2.3	FIO			
154)	Concrete Masonry Units	2.4	FIO			
155)	Bar Positioners	2.12	FIO			
156)	Joint Reinforcement	2.13	FIO			
157)	Reinforcing Steel Bars	2.14	FIO			
158)	Mortar Admixtures	2.10.1	FIO			
159)	Grout Admixtures	2.11.1	FIO			
160) 04200	SD-14 Samples	1.2				
161)	Concrete Masonry Unit	2.4	FIO			
162)	Concrete Brick	2.3	FIO			
163)	Bar Positioners	2.12	FIO			
164)	Joint Reinforcement	2.13	FIO			
165) 05055	SD-08 Statement	1.4				
166)	Welding Procedure Qualifications	1.5	FIO			
167)	Welder/Welding Operator/ Tacker Qualifications	1.6	FIO			
168)	Inspector Qualifications	1.7	FIO			
169) 05055	SD-18 Records	1.4				
170)	Quality Control	3.2	FIO			

* Navy Notes:
Approved by:
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* NASA Notes:
Approved by:
Blank: Contracting Officer

* Army Notes:
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SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								C 153)
								C 154)
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								C 167)
								C 168)
								169)
								C 170)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
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SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
171) 05120	SD-04 Drawings	1.3				
172)	Structural Steel System	1.3	GA			
173)	Structural Connections	1.3	GA			
174) 05120	SD-08 Statements	1.3				
175)	Erection	3	GA			
176) 05120	SD-13	1.3	FIO			
177)	Mill Test Report	2	FIO			
178)	Welder Qualifications	1.3	FIO			
179) 05120	SD-14 Samples	1.3				
180)	CARSen Steel Bolts	2.4	FIO			
181)	CARSon Steel Nuts	2.4	FIO			
182)	Washers	2.4	FIO			
183) 05210	SD-04 Drawings	1.2				
184)	Steel Joists	2.1	GA			
185) 05210	SD-13 Certificates	1.2				
186)	Steel Joists	2.1	FIO			
187) 05300	SD-04 Drawings	1.2				
188)	Deck Units	2.1	GA			

* Navy Notes:
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Approved by:
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SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE (h)	DATE OF ACTION (i)	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR (j)	DATE FWD TO OTHER REVIEWER (k)	DATE RECD FROM OTH REVIEWER (l)	ACT. CODE (m)	DATE OF ACTION (n)	MAILED TO CONTR / RECD FROM APPR AUTH (o)	REMARKS (p)
								171)
							X	172)
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								187)
							X	188)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
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SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
189)	Accessories	2.4	GA			
190)	Attachments	3.2	GA			
191)	Holes & Openings	3.3	GA			
192) 05300	SD-13 Certificates	1.2				
193)	Deck Units	2.1	FIO			
194)	Attachments	3.2	FIO			
195) 05500	SD-04 Drawings	1.2				
196)	Pipe Guards	2.3	GA			
197)	Floor Gratings and Frames	2.4	GA			
198)	Floor Plates	2.5	GA			
199)	Handrails	2.6	GA			
200)	Miscellaneous	2.7	GA			
201)	Floor Plate Covers	2.8	GA			
202)	Safety Chains	2.9	GA			
203)	Steel Stairs	2.10	GA			
204)	Aluminum Sleeves	2.11	GA			
205)	Window "Glazing" Panels	2.12	GA			
206)	Hanger Rods, Connectors for Wood Partitions	2.13	GA			
206a)	Burner Location Sign	2.14	GA			

* Navy Notes:
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SAMPLE SUBMITTAL REGISTER (PART B)

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ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								X 189)
								X 190)
								X 191)
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								X 205)
								X 206)
								X 206a)

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SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
207) 05500	SD-14 Samples	1.2				
208)	Safety Chains	2.9	FIO			
209)	Burner Igniter Shields	2.7	FIO			
210) 06100	SD-01 Data	1.2				
211)	Structural Wood Members	2.1.5	GA			
212) 06100	SD-04 Drawings	1.2				
213)	Structural Wood Member	2.1.5	GA			
214)	Installation of Framing	3.1	GA			
215) 06100	SD-13 Certificates	1.2				
216)	Grading and Marking	2.1.1	FIO			
217) 06200	SD-04 Drawings	1.2				
218)	Finish Carpentry	2.1	GA			
219) 07311	SD-01 Data	1.2				
220)	Roofing System	2.1	GA			
221) 07311	SD-14 Samples	1.2				
222)	Finishes	2.2	FIO			
223) 07600	SD-04 Drawings	1.3				
224)	Materials	2.1	GA			

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SAMPLE SUBMITTAL REGISTER (PART B)

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CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
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(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								207)
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								223)
								X 224)

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SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
225) 07600	SD-08 Statement	1.3				
226)	Contractor Quality Control	3.7	FIO			
227) 07920	SD-01 Data	1.2				
228)	Backing	2.1	GA			
229)	Bond-Breaker	2.2	GA			
230)	Sealant	2.4	GA			
231) 07920	SD-13 Certificates	1.2				
232)	Sealant	2.4	FIO			
233) 08110	SD-04 Drawings	1.2				
234)	Steel Doors and Frames	2.1	GA			
235) 08510	SD-01 Data	1.3				
236)	Steel Windows	2.2	GA			
237) 08510	SD-04 Drawings	1.3				
238)	Steel Windows	2.2	GA			
239) 08510	SD-06 Instructions	1.3				
240)	Steel Windows	3.1	FIO			
241) 08510	SD-13 Certificates	1.3				
242)	Steel Windows	2.2	FIO			

* Navy Notes:
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SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								225)
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								C 242)

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SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
243) 08520	SD-01 Data	1.3				
244)	Aluminum Windows	2.1.1	GA			
245) 08520	SD-04 Drawings	1.3				
246)	Aluminum Windows	2.1	GA			
247) 08520	SD-06 Instructions	1.3				
248)	Aluminum Windows	1.3	F10			
249) 08520	SD-13 Certificates	1.3				
250)	Aluminum Windows	1.3	FIO			
251) 08700	SD-01 Data	1.2				
252)	Hardware and Accessories	2	GA			
253) 08700	SD-07 Schedules	1.2				
254)	Hardware Schedule	3.2	GA			
255)	Keying Schedule	2.6	GA			
256) 08700	SD-13 Certificates	1.2				
257)	Hardware and Accessories	2	FIO			
258) 08700	SD-19 Operation & Maint. Manuals	1.2				
259)	Hardware and Accessories	2	FIO			
260) 08810	SD-01 Data	1.2				

* Navy Notes:
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SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								243)
								X 244)
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								256)
								C 257)
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								C 259)
								260)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
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SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
261)	Glass	2.1	GA			
262)	Glazing Accessories	2.2	GA			
263) 08810	SD-04 Drawings	1.2				
264)	Glazing Materials & Accessories	2.2	GA			
265) 08810	SD-13 Certificates	1.2				
266)	Glass	2.1	FIO			
267) 09900	SD-01 Data	1.2				
268)	Paint	2.1	FIO			
269) 09900	SD-06 Instructions	1.2				
270)	Mixing and Thinning	3.3	FIO			
271)	Application	3.4	FIO			
272) 09900	SD-13 Certificates	1.2				
273)	Lead	2.1.3	FIO			
274)	Mildewcide and Insecticide	2.1.2	FIO			
275)	Volatile Organic Compound (VOC) Content	2.1.5	FIO			
276) 09915	SD-14 Samples	1.3				
277)	Color Board	1.3	FIO			
278) 10522	SD-01 Data	1.3.1	GA			
279)	SD-14 Samples	1.3.1	FIO			
280)	Not Used					

* Navy Notes:
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(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								X 261)
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								280)

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SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
281)	Not Used					
282)	Not Used					
283)	Not Used					
284)	Not Used					
285)	Not Used					
286)	Not Used Not Used					
287)	Not Used					
288) 15052	SD-01 Data	1.5				
289)	Welding Procedure Qualifications	1.6	FIO			

* Navy Notes:
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SAMPLE SUBMITTAL REGISTER (PART B)

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(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								281)
								282)
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SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
290) 15052	SD-13 Certificates	1.5				
291)	Welding and Welding Operator					
292)	Qualifications	1.6.2.1	FIO			
293) 15492	SD-01 Data	1.3				
294)	Components and Equipment Data	2	GA			
295) 15492	SD-04 Drawings	1.3				
296)	LP Gas Piping System	3.1	GA			
297) 15492	SD-06 Instructions	1.3				
298)	Posted Instructions	1.3	GA			
299) 15492	SD-07 Schedule	1.3				
300)	Tests	3.13	GA			
301) 15492	SD-13 Certificates	1.3				
302)	LP Gas System	1.3	GA			
303)	Welding Qualifications	1.2.1	GA			
304) 15492	Operation and Maintenance Manuals	1.3				
305)	Maintenance Manuals	1.3	FIO			
306) 16375	SD-01 Data	1.3				
307)	Short Circuit & Protective Devices					

* Navy Notes:
Approved by:
G: Contracting Officer
Blank: CQC Manager

* NASA Notes:
Approved by:
Blank: Contracting Officer

* Army Notes:
Classification:
GA: Gov't Approval
FIO: For Information Only

SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								290)
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								C 305)
								306)
								307)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
A: Approved RR: Disapproved; Revise and Resubmit
(Others may be prescribed by the Transmittal Form)

SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
308)	Coordination Studies	2.8, 2.9	GA			
309)	Manufacturer's Catalog Data	2	F10			
310)	Material Equip. & Fixture List	2	GA			
311)	Installation Procedure	3.1	FIO			
312) 16375	SD-04 Drawings	1.3				
313)	Elect. Distribution System	3	GA			
314)	As-Built Drawings	3	FIO			
315) 16375	SD-09 Reports	1.3				
316)	Factory Test	2.13	FIO			
317)	Field Testing	3.7	FIO			
318)	Test Reports	3.7.7	FIO			
319)	Cable Installation Reports	3.2.1	F10			
320) 16375	SD-13 Certificates	2	FIO			
321)	Materials and Equipment	1.3	FIO			
322)	Cable Installer Qualifications	1.3	FIO			
323) 16375	SD-19 Operation & Maint. Manuals	1.3				
324)	Electrical Distribution System	3	FIO			
325) 16415	SD-04 Drawings	1.4				
326)	Electrical Work	2.1	GA			

* Navy Notes:
Approved by:
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Blank: CQC Manager

* NASA Notes:
Approved by:
Blank: Contracting Officer

* Army Notes:
Classification:
GA: Gov't Approval
FIO: For Information Only

SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								X 308)
								C 309)
								X 310)
								C 311)
								312)
								X 313)
								C 314)
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								C 317)
								C 318)
								C 319)
								320)
								C 321)
								C 322)
								323)
								C 324)
								325)
								X 326)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
A: Approved RR: Disapproved; Revise and Resubmit
(Others may be prescribed by the Transmittal Form)

SUBMITTAL REGISTER (PART A)

Contract Number: YTPM 989003, FY-98 Project Title: FIRE TRAINING FACILITY, WESTOVER ARB, MA

SPEC SECTION NO.	SD NO. & TYPE OF SUBMITTAL - MATL OR PRODUCT	SPEC PARA NO.	CLASSIF/ APPR BY CO *	GOVT OR A/E REVR	TRANS CONTL NO.	PLAN'D SUBMIT DATE
(a)	(b)	(c)	(d)	(e)	(f)	(g)
327) 16415	SD-09 Reports	1.4				
328)	Materials and Equipment	2.1	GA			
329) 16642	SD-01 Data	1.3				
330)	Materials and Equipment	2	GA			
331) 16642	SD-04 Drawings	1.3				
332)	Installation	3	GA			
333) 16642	SD-08 Statements	1.3				
334)	Qualifications Corrosion Engineer	1.2.3	FIO			
335)	Manufacturer's Installation Inst.	3.1	FIO			
336) 16642	SD-09 Test Reports	1.3				
337)	Testing of System	3.5	FIO			
338) 16642	SD-13 Certificates	1.3				
339)	Materials and Equipment	2	FIO			
340) 16642	SD-19 Operation & Maint. Manuals	1.3				
341)	System Operation	1.3, 3.6	FIO			
342)	Spare Parts	1.3	FIO			

* Navy Notes:
Approved by:
G: Contracting Officer
Blank: CQC Manager

* NASA Notes:
Approved by:
Blank: Contracting Officer

* Army Notes:
Classification:
GA: Gov't Approval
FIO: For Information Only

SAMPLE SUBMITTAL REGISTER (PART B)

Location: | Contractor: |

CONTRACTOR ACTION			APPROVING AUTHORITY ACTION				CONTR	
ACT. CODE	DATE OF ACTION	DATE FWD TO APPR AUTH / DATE RECD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RECD FROM OTH REVIEWER	ACT. CODE	DATE OF ACTION	MAILED TO CONTR / RECD FROM APPR AUTH	REMARKS
(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
								327)
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								C 337)
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								340)
								C 341)
								C 342)

ACTION CODES: NR: Not Reviewed AN: Approved as Noted
A: Approved RR: Disapproved; Revise and Resubmit
(Others may be prescribed by the Transmittal Form)

SECTION 01310

PROJECT SCHEDULE:
NETWORK ANALYSIS SYSTEM
NYD Edition 7/97

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-07 Schedules

Initial Project Schedule; GA. Preliminary Project Schedule; GA. Periodic Schedule Updates; GA.

Four copies of the schedule showing codes, values, categories, numbers, items, etc., as required.

SD-08 Statements

Qualifications; FIO.

Documents showing qualification of personnel preparing schedule reports.

SD-09 Reports

Narrative Report; FIO. Schedule Reports; FIO.

Four copies of the reports showing numbers, descriptions, dates, float, starts, finishes, durations, sequences, etc., as required.

1.2 QUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports. This person shall have previously created and reviewed computerized schedules. Qualifications of this individual shall be submitted to the Contracting Officer for review with the Preliminary Project Schedule submission.

PART 2 PRODUCTS (Not applicable)

PART 3 EXECUTION

3.1 GENERAL

Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS a Project Schedule as described below shall be prepared. The scheduling of construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its

development. Subcontractors and suppliers working on the project should also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

3.2 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel shall result in an inability of the Contracting Officer to evaluate Contractor progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer and those revisions have not been included in the Project Schedule, then the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

3.3 PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manual methods used to produce any required information shall require approval by the Contracting Officer.

3.3.1 Use of the Critical Path Method

The Critical Path method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in either the Precedence Diagram Method (PDM) or the Arrow Diagram Method (ADM).

3.3.2 Level of Detail Required

With the exception of the initial and preliminary schedule submission, the Project Schedule shall include an appropriate level of detail. Failure to develop or update the Project Schedule or provide data to the Contracting Officer at the appropriate level of detail, as specified by the Contracting Officer, shall result in the disapproval of the schedule. The Contracting officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule.

3.3.2.1 Activity Durations

Contractor submissions shall be required to follow the direction of the Contracting Officer regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods. A rule of thumb, that the Contractor should use, is that less than 2 percent of all non-procurement activities' Original Durations shall be greater than 20 days.

3.3.2.2 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, delivery, installation, start-up, and testing.

3.3.2.3 Government Activities

Government and other agencies activities that could impact progress shall be shown. These activities include, but are not limited to: approvals, inspections, utility tie-in, Government Furnished Equipment (GFE) and notice to proceed for phasing requirements.

3.3.2.4 Responsibility

All activities shall be identified in the project schedule by the party responsible to perform the work. Responsibility includes, but is not limited to, the subcontracting firm, contractor work force, or government agency performing a given task. Activities shall not belong to more than one responsible party. The responsible party for each activity shall be identified by the Responsibility Code.

3.3.2.5 Work Areas

All activities shall be identified in the project schedule by the work area in which the activity occurs. Activities shall not be allowed to cover more than one work area. The work area of each activity shall be identified by the Work Area Code.

3.3.2.6 Modification or Claim Number

Any activity that is added or changed by contract modification or used to justify claimed time shall be identified by a mod or claim code that changed the activity. Activities shall not belong to more than one modification or claim item. The modification or claim number of each activity shall be identified by the Mod or Claim Number.

3.3.2.7 Bid Item

All activities shall be identified in the project schedule by the Bid Item to which the activity belongs. An activity shall not contain work in more than one bid item. The bid item for each appropriate activity shall be identified by the Bid Item Code.

3.3.2.8 Phase of Work

All activities shall be identified in the project schedule by the phases of work in which the activity occurs. Activities shall not be

allowed to contain work in more than one phase of work. The project phase of each activity shall be by the unique Phase of Work Code.

3.3.2.9 Feature of Work

All activities shall be identified in the project schedule according to the feature of work to which the activity belongs. Feature of work refers, but is not limited to a work breakdown structure for the project. The feature of work for each activity shall be identified by the Feature of Work Code.

3.3.3 Scheduled Project Completion

The schedule interval shall extend from notice-to-proceed to the contract completion date.

3.3.3.1 Project Start Date

The schedule shall start no earlier than the date that the Notice to Proceed (NTP) was acknowledged. The Contractor shall include as the first activity in the project schedule an activity called "Start Project". The "Start Project" activity shall have: a "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.3.3.2 Constraint of Last Activity

Completion of the last activity in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the critical path. The Contractor shall include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have: a "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

3.3.3.3 Early Project Completion

In the event the project schedule shows completion, the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. Contractor shall specifically address each of the activities noted at every project schedule update period to assist to the Contracting Officer to evaluate the Contractor's ability to actually complete prior to the contract period.

3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constraint to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

3.3.4.1 Start Phase

The Contractor shall include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity shall have: a "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.3.4.2 End Phase

The Contractor shall include as the last activity in a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have: a "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

3.3.4.3 Phase X

The Contractor shall include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" activity shall be logically tied to the earliest and latest activities in the phase.

3.3.5 Default Progress Data Disallowed

Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual Start and Finish dates on the CPM schedule shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report for every in progress or completed activity and insure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes.

3.3.6 Out-of-Sequence Progress

Activities that have posted progress without predecessors being completed (Out-of-Sequence Progress) shall be allowed only by the case-by-case approval of the Contracting Officer. The Contracting Officer may direct that changes in schedule logic be made to correct any or all out-of-sequence work.

3.3.7 Extended Non-Work Period

Designation of Holidays to account for non-work period of over 5 days shall not be allowed. Non-work periods of over 5 days shall be identified by addition of activities that represents the delays. Modifications to the logic of the project schedule shall be made to link those activities that may have been impacted by the delays to the newly added delay activities.

3.3.8 Negative Lags

Lag durations contained in the project schedule shall not have a negative value.

3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The data disk, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1 Preliminary Project Schedule Submission

The Preliminary Project Schedule, defining the Contractor's planned operations for the first 60 calendar days shall be submitted for approval within 10 calendar days after Notice to Proceed is acknowledged. The approved preliminary schedule shall be used for payment purposes not to exceed 60 calendar days after Notice to Proceed.

3.4.2 Initial Project Schedule Submission

The Initial Project Schedule shall be submitted for approval within 40 calendar days after Notice to Proceed. The schedule shall provide a reasonable sequence of activities, which represent work through the entire project and shall be at a reasonable level of detail.

3.4.3 Periodic Schedule Updates

Based on the result of progress meetings, specified in "Periodic Progress Meetings," the Contractor shall submit periodic schedule updates. These submissions shall enable the Contracting Officer or to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgement of the Contracting Officer or authorized representative, is necessary for verifying the contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made.

3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor for the initial submission, and every periodic project schedule update throughout the life of the project.

3.5.1 Data Disks

Two data disks containing the project schedule shall be provided. Data on the disks shall be in the format specified in Appendix A, "Standard Data Exchange Format".

3.5.1.1 File Medium

Required data shall be submitted on 3.5 disks, formatted to hold 1.44 MB of data, under the MS-DOS Version 5.0 operating system.

3.5.1.2 Disk Label

A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type of schedule (Initial, Update, of

Change), full contract number, project name, project location, data date, name and telephone number or person responsible for the schedule, and the MS-DOS version used to format the disk.

3.5.1.3 File Name

Each file submitted shall have a name related to either the schedule data date, project name, or contract number. The Contractor shall develop a naming convention that will insure that the names of the files submitted are unique. The Contractor shall submit the file naming convention to the Contracting Officer for approval.

3.5.2 Narrative Report

A Narrative Report shall be provided with each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities along the 4 most critical paths, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken.

3.5.3 Approved Changes Verification

Only project schedule changes that have been previously approved by the Contracting Officer shall be included in the schedule submission. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

3.5.4 Schedule Reports

The format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float. Actual Start and Actual Finish Dates shall be printed for those activities in-progress or completed.

3.5.4.1 Activity Report

A list of all activities sorted according to activity number or "I-NODE" AND "J-NODE" and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

3.5.4.2 Logic Report

A list of Preceding and Succeeding activities for every activity in ascending order by activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

3.5.4.3 Total Float Report

A list of all activities sorted in ascending order of total float. Activities which have the same amount of total float shall be listed in ascending order of Early Start Dates.

3.5.4.4 Earnings Report

A compilation of the Contractor's Total Earnings on the project from the Notice to Proceed until the most recent Monthly Progress Meeting. This report shall reflect the Earnings of specific activities based on the agreements made in the field and approved between the Contractor and Contracting Officer at the most recent Monthly Progress Meeting. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment.

Activities shall be grouped by bid term and sorted by activity numbers. This report shall: sum all activities in a bid item and provide a bid item percent; complete and sum all bid items to provide a total project percent complete. The printed report shall contain, for each activity: [Activity Number] [or] ["i-node" and "j-node"], Activity Description, Original Budgeted Amount, Total Quantity, Quantity to Date, Percent Complete (based on cost), Earnings to Date.

3.5.5 Network Diagram

The network diagram shall be required on the initial schedule submission and on bi-monthly (60 days) schedule update submissions. In addition to other submission requirements, a single mylar reproducible 20 inch by 30 inch size shall be submitted. The network diagram shall also depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph.

3.5.5.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity or event number, description, duration, and estimated earned value shall be shown on the diagram.

3.5.5.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.5.3 Critical Path

The critical path shall be clearly shown.

3.5.5.4 Banding

Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by category or work, work area and/or responsibility.

3.5.5.5 S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

3.6 PERIOD PROGRESS MEETINGS

Progress meetings to discuss payment shall include a monthly on-site meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting, the Contractor will describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Contracting Officer will approve activity progress, proposed revisions, and adjustments as appropriate.

3.6.1 Meeting Attendance

The Contractor's project Manager and Scheduler shall attend the regular progress meeting.

3.6.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after the monthly progress meeting.

3.6.3 Progress Meeting Contents

Update information, including Actual Start Dates, Actual Finish Dates, Remaining Durations, and Cost to Date shall be subject to the approval of the Contracting Officer. The following minimum set of items which the Contractor shall address, on an activity by activity basis, during each progress meeting.

3.6.3.1 Start and Finish Dates

The Actual Start and Actual Finish dates for each activity currently in-progress or completed activities.

3.6.3.2 Time Completion

The estimated Remaining Duration for each activity in-progress. Time-based progress calculations must be based on Remaining Duration for each activity.

3.6.3.3 Cost Completion

The earnings for each activity started. Payment shall be based on earnings for each in-progress or completed activity. Payment for individual activities shall not be made for work that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

3.6.3.4 Logic Changes

All logic changes pertaining to Notice to Proceed on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-

sequence progress, [lag durations,] and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

3.6.3.5 Other Changes

Other changes required due to delays in completion of any activities or group of activities are those delays beyond the Contractor's control such as strikes and unusual weather. Also included are delays encountered due to submittals, Government Activities, deliveries or work stoppage which makes re-planning the work necessary, and when the schedule does not represent the actual prosecution and progress of the work.

3.7 REQUEST FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, he shall furnish such justification, project schedule data and supporting evidence as the Contracting Officer may deem necessary for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any approvals.

3.7.1 Justification of Delay

The project schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved with this request. The Contracting Officer's determination as to the number of allowable days of contract extension, shall be based upon the project schedule updates in effect for the time period in question and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in the extension of the schedule, shall not be a cause for a time extension to the contract completion date.

3.7.2 Submission Requirements

The Contractor shall submit a justification for each request for a change in the contract completion date of under two weeks based upon the most recent schedule update at the time of the Notice to Proceed or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

a. A list of affected activities, with their associated project schedule activity number.

b. A brief explanation of the causes of the change.

c. An analysis of the overall impact of the changes proposed.

d. A sub-network of the affected area.

Activities impacted in each justification for change shall be identified by a unique activity code contained in the required data file.

3.7.3 Additional Submission Requirements

For any request for time extension for over 2 weeks, the Contracting Officer may request an interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Contracting Officer's request.

3.8 DIRECTED CHANGES

If Notice to Proceed (NTP) is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The proposed revisions to the schedule will be approved by the Contracting Officer prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until the Contractor submits revisions, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, then the Contractor shall advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor will continue to update their schedule with the Contracting Officer's revisions until a mutual agreement in the revisions may be made. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

End of Section 01310

SECTION 01440 CONTRACTOR QUALITY CONTROL 10/94
(NYD EDITION 5/95)

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1992) Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(1993b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable lump sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause entitled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both on-site and offsite, and shall be keyed to the proposed construction sequence. For purposes of this section the term "construction" shall include all activities relating to the erection of buildings, roads, infrastructure, flood control structures, or activities relating to dredging and disposal, demolition, hazardous and toxic waste removal, etc., as indicated in the contract documents. Other sections of the contract documents may also require specially qualified individuals in such areas as data acquisition and safety, etc. The CQC organization will coordinate the activities of these individuals. The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract. The project superintendent in this context shall mean the individual with the responsibility for the overall management of the project including quality and production.

3.2 QUALITY CONTROL PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 90 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause entitled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 90 days of operation.

Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.2 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both on-site and offsite, including work by subcontractors, fabricator, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters will also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01305 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.) The Contractor shall incorporate all tests required by the contract to derive the above list of testing information which shall be presented in matrix form as part of the CQC Plan. This matrix shall be suitable for use by the Contractor and the Government as a checklist to control testing to be done on the contract. Coordinate any additional test submission or plan requirements for Mechanical and Electrical Systems with appropriate specialized specification section if applicable.

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation. Provide matrix of Preparatory and Initial Inspections including specification reference paragraph, the name of the Definable Feature of Work, and spaces for date performed, results, and names of attendees.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks and has separate control requirements. It could be identified by different trades or

disciplines, or it could be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

j. A brief explanation of the duties of the CQC organization with respect to safety. Note that separate Accident Prevention Plan and hazards analysis are required for submission and acceptance.

3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 14 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both on-site and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 General

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure contract compliance. The Contractor shall provide a CQC organization which shall be at the site at all times during progress of the work and with complete authority to take any action necessary to ensure compliance with the contract. All CQC staff members shall be subject to acceptance by the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within his organization at the site of the work who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a graduate of construction management, or shall hold a state Professional Engineer's license, with a minimum of 2 years construction experience on construction similar to this contract, one year of which as a Quality Control Representative. The CQC Manager may also be a construction person with a minimum of 4 years in related work one year of which as a QC Representative. This CQC System Manager shall be on the site at all times during construction and will be employed by the prime Contractor. An

alternate for the CQC System Manager will be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate will be the same as for the designated CQC System Manager. The CQC System Manager shall be assigned no duties other than Quality Control.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: electrical, mechanical, civil, environmental. These individuals shall be directly employed by the prime Contractor or may be employees of the prime or subcontractor; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan.

3.4.4 Additional Requirement

In addition to the above experience and education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management for Contractors". This course is given free of charge by Government personnel and is of two-day duration. The Government will provide one free instruction manual for the course.

3.4.5 Organizational Changes

The Contractor shall maintain his CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS

Submittals shall be made as specified in Section 01305 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements and are submitted in accordance with the date on the submittal register. CQC personnel shall also make physical checks of materials and equipment before installation to insure compliance with approved shop drawings.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work and shall include:

a. A review of each paragraph of applicable specifications.

b. A review of the contract drawings.

c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

d. Review of provisions that have been made to provide required control inspection and testing.

e. Examination of the work area to assure that all required preliminary

work has been completed and is in compliance with the contract.

f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

g. A review of the appropriate activity hazard analysis to assure safety requirements are met per EM 385-1-1, "Safety and Health Requirements Manual".

h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

j. Discussion of the initial control phase.

k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government shall be notified at least 48 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location (i.e. CQC Report number) of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work on-site, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-Up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until

completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon or conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, on-site production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.6.5 Definable Feature of Work: Definition and Discussion

A Definable Feature of Work (DFW) is a portion of work consisting of materials, equipment, supplies and procedures which are closely related to each other, have the same control and will be accomplished by the same work crew to completion. A DFW must be sufficiently small so that control of the work (i.e. communication of requirements to workers, inspection of materials and workmanship and correction of deficiencies) will be easily accomplished. Some examples are:

* Rough-in of electrical boxes and wiring methods
* Lighting fixtures, receptacles, and accessories
* Panelboards, circuit breakers and motors.
* Water supply piping, fittings and supports
* DWV piping, fittings and supports for plumbing
* Concrete reinforcement and formwork
* Concrete mixing, placement, curing and finishing
* Testing Procedure for contaminated soil, materials and storage tank contents
* Storage Tank disassembly and removal
* Setting up of decontamination area, exclusion zones and standard safety procedures for asbestos removal
* Asbestos removal and disposal procedures
* Chemical Data Acquisition
* Preparation, removal and disposal of contaminated material
* Dredging and disposal

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

a. Verify that testing procedures comply with contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data against certified standards.

d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

e. Results of all tests taken, both passing and failing tests, will be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test will be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility will be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of $1500 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3 On-Site Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials will be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Corps of Engineers Division Laboratory, as designated by the Government Representative. Coordination for each specific test, exact delivery location and dates will be made through the Area Office.

3.8 COMPLETION INSPECTION

3.8.1 Pre-Final Inspection

At the completion of all work or any increment thereof established by a completion time stated in the Special Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. Once this is accomplished the Contractor shall notify the Government that the facility is complete and is ready for the Government's "Prefinal" inspection.

The Government will perform this inspection to verify that the facility is complete and ready to be occupied. A Government "Prefinal Punch List" will be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected and so notify the Government so that a "Final" inspection with the customer can be scheduled. Any items noted on the "Final" inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph will be accomplished within the time slated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.8.1.1

Prior to requesting final acceptance inspection, the Contractor shall perform a quality control checkout/test of the igniting/controls systems using propane to verify that valves, regulators, gauges, etc. are functioning properly and are fully operational with no leaks or other malfunctions. Perform the quality control checkout/test as described hereinafter. In order to ensure validity of the testing, propane quantity provided by the contractor must be a minimum of 50 percent of full capacity as appropriate for the weather conditions at the time of such QC checkout/test.

3.8.2 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, his superintendent or other primary management person and the Contracting Officer's representative will be in attendance at this inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon notice from the Contractor. This notice will be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and must include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause entitled "Inspection of Construction".

3.9 QUALITY CONTROL CHECKOUT/TEST

3.9.1

Ambient temperature must be above 40 degrees F during testing.

3.9.2

The Contractor shall fill the holding pond and burn pit with water as and when appropriate for this test.

3.9.3

In addition to safety procedures as noted within the testing procedure itself, no testing shall take place without the Base Fire Marshall and/or his representatives being present with safety equipment that they deem necessary for testing. Except for performing initial electrical system or nitrogen testing (without propane in the system piping), no one shall get any closer to the burn pit than the observation tower (or an equivalent distance) without the express permission of both the Fire Marshall and the on-site representative of the Corps of Engineers. Testing will be performed by the Contractor and verified by the Base Fire Department and Corps of Engineers.

3.9.3.1.

Verify the operation of the nitrogen system by testing that the low pressure alarm light is illuminated when the gas pressure is lowered to 20 pounds above the lowest pressure that the propane valves will safely operate at. Manually operate each propane burner valve to assure that each valve will open and close using compressed air instead of propane.

3.9.3.2.
Prior to any testing as noted below, all piping systems shall have passed current contractual pressure testing (paragraph 15492-3.10.1.1). Paragraph 15492-3.10.1.2, INITIAL Fill, requires a leak test after the initial fill with propane. Because of the cooling affects, leaks may be expected after this initial fill that may otherwise not be noted with just a pressure test. Paragraph 3.10.1.3 PURGING, requires a purge of the propane system to ensure that all air has been remove from the line to avoid a possible build up of a combustible mixture of air and propane in the line.

3.9.4

Before ANY propane is introduced into the system, visible sparks shall be confirmed at EACH of the ignitors and, in general, the electrical and nitrogen gas portion of the system shall be confirmed. It shall be confirmed that the spark is adequate to ignite propane by using a portable hand held source of propane at the ignitor. If visible sparks are not evident at any of the ignitors, no propane shall be introduced into that particular propane line until the problem is resolved.

3.9.4.1

Energize the control panel, and verify control power “on” light is on indicating the nitrogen pressure is within limits. Verify all alarm and indicating lights are off.

3.9.4.2

Verify all ignitors spark when the appropriate selector switch is operated in the “ignitor” position.

3.9.4.3

Verify all the nitrogen pilot valves open when the selector switch is operated in the “gas” position. Verify the valve closes when the selector switch is operated in the “off” position. Verify green pilot light is on when the switch is in the “gas” position.

3.9.4.4

Test the emergency cut-off switches.

a. The emergency cutoff switches shut down all ignitor and nitrogen pilot valves in the valve pit and applies power to the air frame sprinkler value.

b. The ball valve shut off valve eliminates pressure on the gas system shut-off valves.

3.9.4.5

Test emergency shut off valve at the control stand.

3.9.4.6

Contractor shall individually test each of the 15 ignitors and nine (9) pressure regulating valves (PRV) in the propane lines between the control tower and the burn pit.

3.9.4.7

The initial pressure set of the individual pressure regulating valves on the 3/4” propane lines shall be as noted on the nozzle rating on the Equipment List on Drawing No. P-4. The main purpose of these valves is to regulate the intensity of the flame, so the final settings on these valves will be made by the Air Force at a later date. Upon initial startup, all (15) 3/4” and 1” ball valves at the tower shall be off, opening them only when that particular nozzle/ignitor is being tested.

3.9.4.8

Test for ignition of propane with no water in the pit. Open the manual ball valves on the propane system to the air frame burners. Operate switch to the “gas” position. Upon ignition of propane, operate switch to the “off” position. Continue with subsequent burners.

3.9.4.9

Close drain valves at the burn pit.

3.9.4.10

Open valves alternately to the header and each of the water systems and verify discharge of water. Open valves until burn pit is full.

3.9.4.11

Finish filling burn pit directly from the fire hydrants, if necessary. (This may be accomplished simultaneously with step 10).

3.9.4.12

Balance water flow to the three engines. Set the water flow for each water jacket for the aircraft mock-up ignitor circuits see Dwg P-2A

3.9.4.13

Energize propane system. Test for ignition of propane at all ground burners.

3.9.4.14

Test shall start with any of the (9) airframe ignitors versus the (6) ground pool ignitors. Test shall begin on an ignitor that has a visual sight line from the Control Tower or a visual sight line at an equivalent distance. The spark shall be started at the ignitor/propane nozzle to be first tested. After the spark is established, the ball valve on the Tower to that nozzle shall be opened approximately half way. If the propane ignites, the flame shall be adjusted upward and downward by way of the PRV and the ball valve on the individual line. The ball valve shall then be turned off. Only after the flame goes out at the nozzle is the spark to be shut off. Then testing is to proceed to the next ignitor/nozzle and the procedure repeated. If the propane does not ignite within 20 seconds of the ball valve being opened, the ball valve shall be closed and propane be allowed to dissipate at the burn pit before further testing proceeds. Water flow to the water jackets is required anytime a substantial fire is present to protect ignition circuit wiring.

a. After all airframe ignitors have been proven, proceed in a similar manner with the ground ignitors.

b. If all ignitors individually check out okay, all 15 ignitors shall be lit off one by one, at which time the capacity of the main pressure regulating valve will be verified. Each of the 15 lines shall be shut off one by one with at least a 30 second interval.

3.9.4.15

Shut the system down and submit a report using the “Check List” forms at the end of this Section).

3.10 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

a. Contractor/subcontractor and their area of responsibility.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-Up). List deficiencies noted along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

f. Submittals reviewed, with contract reference, by whom, and action taken.

g. Off-site surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and/or specifications.

j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 16 hours after the date(s) covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every seven days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel. All documentation is expected to be literate, legible and complete.

3.11 SAMPLE FORMS

a. The 2-page form at the end of the section will be used for the basic CQC Report. CQC personnel shall attach continuation sheets as required for any entries which cannot fit on the basic form. Preparatory and Initial Inspections, when performed, shall be indicated on the basic CQC report and minutes for each inspection shall be attached. Minutes will consist of a list of specific requirements for materials, procedures or equipment to be employed and shall also include any understandings reached or items of special importance discussed.

b. In addition, outstanding deficiencies shall be listed on the form "List of Outstanding Deficiencies" at the end of this section and shall be attached to each CQC report. As deficiencies are corrected, they are to be acknowledged on the basic CQC report and shall be deleted from the list.

c. Form at the end of this section entitled "CQC Test Report List" shall be used by the Contractor to track testing to be done as the project progresses, and also to summarize the Contractor's Quality Control testing to be reported on the CQC Plan.

d. Form "Record of Preparatory and Initial Inspections" at the end of this section shall be used by the Contractor to track Preparatory and Initial inspections as the project progresses and also to summarize these required inspections as part of the CQC Plan.

e. Form “Check List” shall be used by the Contractor to perform and report on “Quality Control Checkout/Test”.

f. Additional reporting forms pertaining to specialized activities may be included herein or elsewhere in the contract, and shall be used for reporting as indicated.

3.12 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the worksite, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

Deficiencies cited and verbal instructions given to the Contractor by the Government Representative shall be entered into that day's CQC Report

(FORMS FOLLOW)

End of Section

CHECK LIST

ITEMS (3.9.4) 1, 2, AND 3

LOCATION	RED PILOT LIGHT	IGNITOR SPARK	PROPANE VALVE	GREEN PILOT LIGHT
RIGHT WING GROUND	_____	_____	_____	_____
OUTBOARD ENGINE	_____	_____	_____	_____
INBOARD ENGINE	_____	_____	_____	_____
RIGHT FRONT GROUND	_____	_____	_____	_____
RIGHT AFT GROUND	_____	_____	_____	_____
APU	_____	_____	_____	_____
WHEEL WELL	_____	_____	_____	_____
COCKPIT	_____	_____	_____	_____
BATTERY	_____	_____	_____	_____
PASSENGER COMP.	_____	_____	_____	_____
CARGO	_____	_____	_____	_____
HIGHTAIL ENGINE	_____	_____	_____	_____
LEFT FRONT GROUND	_____	_____	_____	_____
LEFT AFT GROUND	_____	_____	_____	_____
LEFT WING GROUND	_____	_____	_____	_____

ITEM (3.9.4) 4.

4 a. IGNITORS DE-ENERGIZED_____
SOLENOID VALVES CLOSED _____

4 b. NITROGEN SOLENOID VALVE _____
VAPOR INTERNAL VALVE _____
LIQUID SUPPLY INTERNAL VALVE _____
TRUCK UNLOADING EMERGENCY SHUT OFF VALVE _____

ITEM (3.9.4) 5
CONTROL STAND EMERGENCY SHUT OFF VALVE _____

ITEMS (3.9.4) 3, 8 AND 13

LOCATION	STOP SWITCH	TIMER	IGNITION OF PROPANE	FLOODED PIT IGNIT.
RIGHT WING GROUND	_____	_____	_____	_____
OUTBOARD ENGINE	_____	_____	_____	_____
INBOARD ENGINE	_____	_____	_____	_____
RIGHT FRONT GROUND	_____	_____	_____	_____
RIGHT AFT GROUND	_____	_____	_____	_____

APU	_____	_____	_____	_____
WHEEL WELL	_____	_____	_____	_____
COCKPIT	_____	_____	_____	_____
BATTERY	_____	_____	_____	_____
PASSENGER COMP.	_____	_____	_____	_____
CARGO	_____	_____	_____	_____
HIGHTAIL ENGINE	_____	_____	_____	_____
LEFT FRONT GROUND	_____	_____	_____	_____
LEFT AFT GROUND	_____	_____	_____	_____
LEFT WING GROUND	_____	_____	_____	_____

CQC REPORT No:_____ Date:_____ Sh._____ of _____

1. Project Title:_____

Location:_____ Contract No.:_____

2. List Contractors and Subs Working This Day and Areas of

Responsibility of each:

_____

_____

_____

3. Weather:

_____

4. Description and Location of Work of the Project (Also Indicate

Days of No Work and reasons for Delay) Include NAS Activity #.

_____

_____

_____

_____

5. Labor and Equipment Breakdown by Trade Incl Hours Worked (Attach Continuation)

_____

_____

_____

6. Follow-Up Inspections Performed, Results and Corrective Actions Taken:

_____

_____

_____

_____

_____

_____

_____

_____

_____

CQC REPORT No:_____ Date:_____ Sh._____ of _____

7. Job Safety. Indicate What Was Checked, Results, Instructions Received and Corrective Actions:

_____

_____

_____

_____

_____

8. Additional Activities and Remarks (Check Appropriate Box)

[ ] a. Prep or Initial Insp. Held. Attach Minutes.
[ ] b. Testing Performed. Attach Results.
[ ] c. Outstanding Deficiencies. See Attached List
[ ] d. Instructions Received From Govt Rep.
[ ] e. Delivery of Equipment and Materials.
[ ] f. Submittal Actions.
[ ] g. Misc/Remarks.

Use Space Below To Describe Checked Items

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

9. Contractor's Verification: "The above report and attachments are complete and all Supplies, Materials, Equipment and Workmanship incorporated into the work are in full compliance with the contract except as noted":

Signed _____ Date_____
CQC Representative

RECORD OF PREPARATORY AND INITIAL INSPECTIONS

DATE OF INSP	TYPE OF INSP	DEFINABLE FEATURE OF WORK (DESCRIBE)	REPORT NOS		ATTENDING PERSONS INSP	WAS MATL&/OR EQUIPMENT PHYSICALLY INSPECTED?
			QA	QC		

NAD FORM
826
22 JULY 86

NOTE:THIS FORM SHALL BE USED BY THE CONTRACTOR TO TRACK PREP/INIT INSP'S
ATTACH ADDITIONAL RESULTS OR COMMENTS AS REQUIRED

QCFORM01

LIST OF OUTSTANDING DEFICIENCIES

SH_____ OF _____ DATE:_____

PROJECT TITLE:_____ CONTRACTOR:_____

LOCATION:_____ CQC REPORT#_____ CONTRACT #:_____

SPEC REF OR DWG#	LOCATION ON PROJECT	DESCRIPTION OF DEFICIENCY	DATE FOUND	DATE TO BE CORRECTED	DATE CORRECTED	REMARKS

NOTE: THIS FORM SHALL BE USED BY THE CONTRACTOR TO TRACK OUTSTANDING CONSTRUCTION DEFICIENCIES

QCFORM02

CQC TEST REPORT LIST

CQC REPORT#_____ SH_____ OF _____ DATE:_____

CONTRACTOR:_____ CONTRACT #:_____

PROJECT TITLE:_____ LOCATION:_____

SPEC REF OR DWG.#	TYPE OF TEST	DATE PERFORMED	RESULTS	REMARKS

NOTE: THIS FORM SHALL BE USED BY THE CONTRACTOR TO TRACK CQC TESTING. PROVIDE ATTACHMENTS AS REQUIRED.

QCFORM03

SECTION 01451

TESTING FOR MECHANICAL AND ELECTRICAL SYSTEMS

1. Applicability.

This section applies to all mechanical and electrical systems and all systems using electromagnetically driven equipment, pneumatic or electronic systems; high and low voltage electrical distribution systems (except branch panels) and to any system which incorporates this section into other parts of the specification by reference. For purposes of this section a "system" is an entity comprised of a series of closely related interdependent components and which is capable of independent performance of a useful function. System components shall include all software and programming as applicable for the system. Some typical examples include:

a. Independently functioning HVAC Systems.

b. Fire Alarm Systems.

c. Public Address Systems.

d. Sprinkler Systems including alarms.

e. Telephone Systems including line protectors, splices cables, switching equipment, outlets and instruments.

f. Intrusion Detection System.

g. High Voltage Equipment including cable, splices, switchgear, relays, circuit breakers, fuses, transformers, instrumentation, etc.

h. Low Voltage Switchboard including incoming and outgoing feeders, circuit protection and all accessories.

2. Test Plan.

a. Not later than sixty days after Notice to Proceed, in accordance with Section "Submittals" and other paragraphs of the technical provisions, the Contractor shall submit a list for approval consisting of all systems for which test plans are required. This list will be reviewed by the Government and any systems found to be missing will be required to be added by the Contractor, and appropriate test plans submitted. No work will be permitted on any of the above systems until this list is submitted.

b. The Contractor shall develop test plans and schedule operational testing for the systems in the approved list. The testing shall be in accordance with the requirements in the appropriate technical provisions and shall include as a minimum the requirements below. All testing required by applicable codes, standards, utility companies, manufacturers, suppliers, etc. shall be incorporated into the Contractor's test plans. Test plans shall list all equipment required to perform the tests, and any Government support required. It shall be in sufficient detail to permit a step-by step approach to the test and to demonstrate that the systems operate as intended by the contract documents. It shall describe as a minimum:

1. What system is being tested including a listing of all components to be tested.

2. What individual or organization will perform testing, who

will certify the tests, and qualifications of test personnel.

3. A step by step narrative of the testing procedure to be used to demonstrate contract compliance including all governing standards, such as "sequence of controls", "ASTM Standard XXX"; or IEEE Standard XXX", etc.

4. What testing equipment will be utilized.

5. What operator interaction is required.

6. What results are to be expected.

7. Seasonal limitations, if any, including date(s) of proposed testing.

8. A complete schematic diagram (electrical, pneumatic) showing all components, and block diagram.

9. A checklist shall be developed to be used during the operational test.

c. Test plans shall be submitted for approval for all systems contained on the list submitted per para. 2a above. It is also desirable to submit all test plans as soon as possible so that the progress of the project and corresponding payments will proceed on schedule.

3. Testing Process. Outlined below are a number of events relating to the status of the test plan and testing. The corresponding percentages indicate the maximum percentage of the value of the system which will be permitted to be installed after the successful completion of the corresponding event indicated, for all systems to which this section applies. Events must be completed sequentially. Any work performed in excess of the permitted percentages will be at the Contractor's own risk and will not be paid until the event corresponding to the percentage of system value permitted to be installed is successfully completed:

EVENT	MAX. % of SYSTEM VALUE PERMITTED TO BE INSTALLED
1. Contractor has submitted list of systems that require test plans to be approved, and system work is ongoing but no test plan submitted.	50
2. Test Plan Submitted	65
3. *Test Plan Approved	80
4. Successful completion of tests including submission of required documents, reports (i.e. balancing reports for all HVAC Systems), Operation and Maintenance Manuals spare parts, and spare parts data.	**100

* The Government will process the submittal in accordance with the time frames indicated in the specification section "Submittals". If the test plan is disapproved the Government has an additional 30 days to review the resubmittal from the date it receives the resubmittal.

** If a system involves both heating and cooling modes and one mode has been successfully tested this percentage shall be reduced to 90% until the testing is completed.

b. The Contractor may proceed with events as indicated in the above table for each system separately.

4. Operational tests including performance tests shall be conducted for an entire system, not component parts only. Tests may be conducted only after an entire system has been completely installed. Contractor shall provide a minimum of 14 days notice to the Contracting Officer of scheduled tests. This notice must include the Contractor's assurance that all installed work previously identified to the Contractor as being unacceptable along with all remaining work associated with the respective system will be complete and acceptable by the date scheduled for the operational test. Failure of the Contractor to have all contract work acceptably complete for this test will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection costs.

5. For each system the Contractor shall obtain the services of an experienced professional who shall certify that the operational test was conducted in accordance with the approved test plan and the results of this test meet all the contract requirements. These individuals must have a minimum of eight years experience in the testing of the particular system being tested and shall also meet qualifications (if any) set forth in other technical sections of the contract specifications.

6. When considering the value of a system for payment purposes the following components shall be counted as part of a "system": All electro-magnetically driven equipment; pneumatic or electric control system; gauges, dampers, valves, actuators, controllers, pipes, test sensing elements, logic/processors, CPU's, ducts, insulation, wiring, conduit, switchgear, and all other mechanical or electrical components, devices or equipment which are essential to the proper function of the system such as pumps, motors, air-handling units, chillers, cooling towers, etc. Software programs and any refrigerants are also considered "parts" of a system.

7. The requirements contained in this section supplement other testing requirements contained in the contract documents. Refer to Section 01440 “Contractor Quality Control” and other sections of the contract documents for the test requirements for the specific systems. If a conflict exists between the requirements of this section and other parts of the contract documents, the requirements of this section shall take precedence.

END OF SECTION 01451

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

1.1 GENERAL REQUIREMENTS

1.1.1 Site Plan

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The Contractor shall also indicate if the use of a supplemental or other staging area is desired.

1.1.2 Identification of Employees

The Contractor shall be responsible for furnishing to each employee and for requiring each employee engaged on the work to display identification as approved and directed by the Contracting Officer. Prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of any employee. When required, the Contractor shall obtain and provide fingerprints of persons employed on the project. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

1.1.3 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the military installation.

1.2 AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1 Utility Services Provided by Contractor

The Contractor shall provide all utilities required for construction, including potable water, electrical services, temporary heating/cold weather protection, etc. complete with necessary site distribution system.

1.2.2 thru 1.2.4 (Not Used)

1.2.5 Sanitation

The Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

1.2.6 Telephone

The Contractor shall make arrangements and pay all costs for telephone facilities desired.

1.3 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction, the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of

barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

1.3.1 Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the Contracting Officer shall be removed.

1.3.2 Safety Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.4 CONTRACTOR'S TEMPORARY FACILITIES

1.4.1 Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

1.4.2 Storage Area

The Contractor shall construct a temporary 6-foot high chain link fence around trailers and materials. The fence shall include plastic strip inserts, colored green or brown, so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Trailers, materials, or equipment shall not be placed or stored outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the military boundaries. Trailers, equipment, or materials shall not be open to public view with the exception of those items, which are in support of ongoing work on any given day. Materials shall not be stockpiled outside the fence in preparation for the next day's work. At the end of each work day mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area. No storage of motor fuels or oil will be allowed at the site. See Section 01560 for more explicit information.

1.4.3 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and

materials. This area may not be in close proximity of the construction site but shall be within the military boundaries. Fencing of materials or equipment will not be required at this site; however, the Contractor shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

1.4.4 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers that, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the military property.

1.4.5 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse with construction equipment or other vehicles grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Contractor's discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

1.4.6 New Building

In the event, a new building is constructed for the temporary project field office, it shall be a minimum 12 feet in width, 16 feet in length and have a minimum of 7 feet headroom. It shall be equipped with approved electrical wiring, at least one double convenience outlet and the required switches and fuses to provide 110-120 volt power. It shall be provided with a work table with stool, desk with chair, two additional chairs, and one legal size file cabinet that can be locked. The building shall be waterproof, shall be supplied with heater, shall have a minimum of two doors, electric lights, a telephone, a battery operated smoke detector alarm, a sufficient number of adjustable windows for adequate light and ventilation, and a supply of approved drinking water. Approved sanitary facilities shall be furnished. The windows and doors shall be screened and the doors provided with dead bolt type locking devices or a padlock and heavy duty hasp bolted to the door. Door hinge pins shall be non-removable. The windows shall be arranged to open and to be securely fastened from the inside. Glass panels in windows shall be protected by bars or heavy mesh screens to prevent easy access to the building through these panels. In warm weather, air conditioning capable of maintaining the office at 50 percent relative humidity and a room temperature 20 degrees F below the outside temperature when the outside temperature is
95 degrees F shall be furnished. Any new building erected for a temporary field office shall be maintained by the Contractor during the life of the contract and upon completion and acceptance of the work shall become the property of the Contractor and shall be removed from the site.

1.4.7 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment; in addition, the Contractor shall notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

1.5 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away. Materials resulting from demolition activities, which are salvageable, shall be stored within the fenced area described above or at the supplemental storage area. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored.

1.6 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

-- End of Section 01500--

SECTION 01540

SECURITY

PART 1 GENERAL

a. All project work will take place in a Controlled or Restricted Area (i.e., active aircraft runways, taxiways, pads, aprons).

b. All work will be coordinated on a daily basis with Chief, Airfield Management, to allow normal aircraft operations and activities to continue during project.

PART 2 - PRODUCT (Not Used)

PART 3 - EXECUTION

3.01 EXECUTION

A. At the end of each work day, secure all entrances to the work area. Securing methods shall be approved by the Contracting Officer.

B. Restrict all activities and movement of workmen and equipment to the designated project area.

C. The Contractor shall enter the project site only at Gate adjacent to Bldg. 3400. Location of daily work sites will be a time not later then that approved by the Contracting Officer. The purpose is to maximize safety and security as the Contractor will be working in the vicinity of active runways/taxiways and other flight operations.

D. The Contractor shall comply with flightline driving procedures and restrictions briefed by Airfield Management.

E. Contractor shall obtain vehicle passes from Airfield Management for all vehicles operating on the flightline.

3.02 IDENTIFICATION BADGES

a. Identification Badges are required for projects on Westover ARB property and are to be obtained by submitting a letter to the Contracting Officer with the names of all the Contractor's employees requiring badging. This listing shall show the contract number, the full name, address, and social security number of all employees, and the Contractor's full address and telephone number.

b. Badges shall be worn at all times while on Base and shall be visible at all times.

c. Contractor shall be responsible for the return of all Identification Badges to the Contracting Officer after completion of the project. Final payment will not be made until all badges are returned.

3.03 SECURITY ESCORTS

The Government requires Contractor personnel including subcontractor personnel to be escorted by a Government representative while working in restricted areas of the Base.

3.04 RESTRICTIONS

The Contractor shall not allow cameras on the project site nor photographs to be taken without written permission of the Contracting Officer.

END OF SECTION 01540

SECTION 01560 - ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

The work covered by this section consists of furnishing all labor, materials and equipment, and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract, except for those measures set forth in the General and Technical Provisions. For the purpose of this specification, environmental pollution is defined as any discharge of materials into the air, water, or soil, which is in violation of current pollution control laws or environmental regulations. In addition, the Contractor shall be responsible for controlling erosion and sediment transport, protecting existing trees and plant materials to be retained, eliminating noise detrimental to human health and preserving historic resources. All environmental issues shall be coordinated through the Base Environmental Committee and the Base Civil Engineering Office in addition to the general coordination of the project by the U.S. Army Corps of Engineers.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications listed below shall be latest issue. The publications are referred to in the text by the basic designation only.

CODE OF FEDERAL REGULATIONS (CFR):

29 CFR Part 1910 Hazardous Waste Operations and Emergency Response; Final Rule

40 CFR 261 Regulations Identifying Hazardous Waste

40 CFR 262 Regulations for Hazardous Waste Generators

40 CFR 263 Regulations for Hazardous Waste Transporters

40 CFR 264 Regulations for Owners and Operators of Permitted Hazardous Waste Facilities

49 CFR 178 Regulations for Shipping Container Specifications

1.3 DEFINITIONS:

1.3.1 Sediment

Soil and other debris that has eroded and has been transported by runoff water or wind.

1.3.2 Solid Waste

Rubbish, debris, garbage, and other discarded solid materials, except hazardous waste as defined in paragraph entitled "Hazardous Waste," resulting from industrial, commercial, and agricultural operations and from community activities.

1.3.3 Rubbish

Combustible and noncombustible wastes such as paper, boxes, glass, crockery, metal, lumber, cans, and bones.

1.3.4 Debris

Combustible and noncombustible wastes such as ashes and waste materials resulting from construction or maintenance and repair work, leaves, and tree trimmings.

1.3.5 Chemical Wastes

This includes salts, acids, alkalies, herbicides, pesticides, and organic chemicals.

1.3.6 Sanitary Wastes

1.3.6.1 Sewage

Waste characterized as domestic sanitary sewage.

1.3.6.2 Garbage

Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.3.7 Hazardous Waste

Hazardous substances as defined in 40 CFR 261 or as defined by applicable state and local regulations.

1.3.8 Oily Waste

Petroleum products and bituminous materials.

1.4 SUBMITTALS

Government approval is required for submittals with a 'GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300, SUBMITTAL DESCRIPTIONS.

SD-08, Statements:

Environmental Protection Plan; GA.
Health and Safety Plan; GA.

Preconstruction Survey Report; FIO.

Administrative or Closeout Permits; FIO.

a. Solid Waste Disposal Permit: Submit to the Contracting officer, one copy of a state and local permit or license, showing such agencies' approval of the disposal plan.

b. Disposal Permit for Hazardous and Oily Wastes: Submit to the Contracting Officer, a copy of the applicable EPA and state permits or licenses for transportation, treatment, storage, and disposal of hazardous and oily wastes by permitted facilities.

1.5 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary and environmental

features associated with the project. Comply with Federal, state, and local regulations pertaining to the environment, including but not limited to water, air, and noise pollution.

1.5.1 Environmental Protection Plan

Five days after the Notice to Proceed of contract, the Contractor shall meet with the Contracting Officer to discuss the proposed environmental protection plan and to develop mutual understanding relative to the details of environmental protection, including measures for protecting natural resources, required reports, and other measures to be taken. The plan shall also include measures for erosion control during dewatering operations.

1.5.1.1 Environmental Planning

Fourteen days after the environmental protection meeting, submit to the Contracting officer the proposed environmental plan for further discussion, review, and approval.

1.5.1.2 Commencement of the Work

As directed by the Contracting officer, following approval.

1.5.2 Preconstruction Survey

Perform a preconstruction survey of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site.

1.5.3 Health and Safety Plan

Health and Safety Plan (per OSHA requirements). The handling and storage of hazardous materials shall conform to Federal, State and local regulations. Handling and storage procedures shall be included in the environmental protection plan and shall be reviewed and approved by the Base Environmental Engineer and Fire Technical Services.

1.6 NOTIFICATION OF NON-COMPLIANCE

The Contracting Officer will notify the Contractor of any non-compliance with the provisions of this section and the action to be taken. The Contractor shall, after receipt of such notice, immediately take corrective action. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the Work until satisfactory correction action has been taken. No part of the time lost due to any such stop order shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.6.1 Subcontractor

Compliance with the provisions of this section by subcontractors will be the responsibility of the Contractor.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified.

3.1.1 Land Resources

Do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting officer. Where such uses of attach ropes, cables, or guys are authorized, the Contractor shall be responsible for any resultant damage.

3.1.1.1 Protection

Protect existing trees, which may be injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas.

3.1.1.2 Replacement

Remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features. Obtain Contracting Officer's approval before replacement.

3.1.1.3 Location of Temporary Storage and Service Facilities

The location on Government property of the Contractor's storage and service facilities, required temporarily in the performance of the work, shall be upon cleaned portions of the job site, on areas to be cleaned, or upon areas designated for such use. The preservation of the landscape shall be an imperative consideration of the selection of sites for construction of temporary buildings. Plans showing storage and service facilities shall be submitted for approval to the Contracting Officer. If the Contractor proposes to construct temporary roads, utilities, embarkment or excavation for work areas, he shall submit a plan for approval prior to start of such temporary work.

3.1.1.4 Petroleum Storage

No storage of gasoline or diesel fuel oils and lubricants will be allowed. All equipment fueling shall be done within a controlled area. Contractor shall submit location of this area as part of the environmental plan. The area shall be part of the defined Contractor storage area. All fueling shall be from a fuel delivery truck.

3.1.1.5 Temporary Construction

Remove traces of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other signs of construction. Grade temporary roads, parking areas, and similar temporarily used areas to conform to surrounding contours.

3.1.2 Water Resources

3.1.2.1 Oily Wastes

Prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water. Surround all temporary fuel oil or petroleum storage tanks with a temporary earth berm, lined with petroleum resistant

impermeable fabric, of sufficient size and strength to contain the contents of the tanks in the event of leakage or spillage.

3.1.3 Fish and Wildlife Resource

Do not disturb fish and wildlife. Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife.

3.2 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

All work shall be stopped in the vicinity when cultural resources (such as arrowheads, pottery pieces, building foundations, etc.) or human remains are discovered. The Cultural Resources Manager, shall be notified immediately of the discovery.

3.3 EROSION AND SEDIMENT CONTROL MEASURES

3.3.1 Refer to Drawings No. CC-3 and CC-4. Also refer to "Inspection and Maintenance Report" form (three pages) at the end of this section.

3.3.1.1 Erosion and Sediment Control Inspection and Maintenance Procedures for Attached Inspection Report Forms

a. No more than 5 acres of unprotected soil will be exposed at any one time. All measures shall be maintained in good working order; if a repair is necessary, it shall be initiated within 24 hours.

b. Seed and stabilize all areas within 15 days of final grading. In areas where construction has been suspended or sections completed, seed and stabilize immediately. Maintenance will be performed as necessary to ensure continued stabilization. Temporary and permanent seeding and planting will be inspected for any bare spots, washouts, and healthy growth.

c. All structural control measures, areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized and locations where vehicles enter or exit the site will be inspected at least once each week and within 24 hours of the end of a storm that is 0.5 inches or greater. Locations where vehicles enter or exit the site shall be inspected for evidence of off site sediment tracking.

d. Where portions of the construction area have been finally stabilized, inspection of such portions shall be conducted at least once every month until the entire site is finally stabilized.

e. Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system.

f. Erosion and sediment control measures identified in the plan shall be observed to ensure that they are operating correctly.

g. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters

h. Silt fence will be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts

are firmly in the ground. Built up sediment will be removed from silt fence when it has reached one-third the height of the fence.

i. The sediment basins and traps will be inspected for depth of sediment, and built up sediment will be removed when it reaches 10 percent of the design capacity or at the end of the job.

j. A maintenance inspection report will be made after each inspection (use the attached 3 page form). The inspection reports shall be retained for at least three years from the date that the site is finally stabilized as part of the storm water pollution prevention plan. The person making these reports shall sign the certification on page 3 of the form.

k. Based on the results of the inspection, revise the site description and the pollution prevention measures identified in the plan as appropriate, but in no case later than 7 calendar days following the inspection.

3.3.2 Burnoff

Burnoff of the ground cover is not permitted.

3.3.3 Protection of Erodible Soils:

Immediately finish the earthwork brought to a final grade. Immediately protect the side slopes and back slopes upon completion of rough grading. Plan and conduct earthwork to minimize the duration of exposure of unprotected soils.

3.3.4 Temporary Protection of Soils

Use the following methods to prevent erosion and control sedimentation:

3.3.4.1 Mechanical Retardation and Control of Runoff

Mechanically retard and control the rate of runoff from the construction site. This includes construction of diversion ditches, benches, filter fabric dams, straw bale dikes, and berms to retard and divert runoff to protected drainage courses.

3.3.4.2 Vegetation and Mulch

Provide temporary protection on sides and back slopes as soon as rough grading is completed or sufficient soil is exposed to require erosion protection. Protect slopes by accelerated growth of permanent vegetation, temporary vegetation, mulching, or netting. Stabilize slopes by hydroseeding, anchoring mulch in place, covering with anchored netting, sodding, or such combination of these and other methods necessary for effective erosion control.

a. Seeding: Provide new seeding where ground is disturbed. Include topsoil or nutrient during the seeding operation necessary to establish a suitable stand of grass.

3.3.5 No more than 5 acres of unprotected soil shall be exposed at any one time. This is a requirement of the SPDES for construction activities.

3.4 CONTROL AND DISPOSAL OF SOLID AND SANITARY WASTES

Pick-up solid wastes, and place in containers which are regularly emptied. Do not prepare, cook, or dispose of food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. On completion, leave the areas clean.

3.4.1 Disposal of Rubbish and Debris

Dispose of rubbish and debris in accordance with the requirements specified.

3.4.1.1 Removal from Government Property

Remove and dispose of rubbish and debris from Government property, as a minimum, on a monthly basis.

3.4.2 Sewage, Odor, and Pest Control

Use chemical toilets or comparably effective units and construct and maintain an approved type of adequate sanitary convenience for the use of persons employed on the work. Include provisions for pest control and elimination of odors.

3.5 CONTROL AND DISPOSAL OF HAZARDOUS WASTE

3.5.1 Hazardous Type Waste

Store hazardous waste in approved containers in accordance with 49 CFR 178 properly labeled to identify the type of waste and the date the container was filled. Remove the containers from the project site, and store and dispose of hazardous waste in accordance with 40 CFR 262, 40 CFR 263 and 40 CFR 264. For oil and hazardous material spills, notify the Contracting Officer, the Base Fire Department and the Base Civil Engineer's Environmental Group immediately. Operations and response shall be in accordance with 29 CFR Part 1910.

3.5.2 Petroleum Products

Conduct the fueling and lubricating of equipment and motor vehicles to protect against spills and evaporation. Dispose of lubricants to be discarded and all excess oil.

3.5.3 Lead-Acid Battery Electrolyte

Dispose of electrolyte solution from lead-acid batteries. Do not dump electrolyte onto the ground or into storm drains or sanitary sewers. use one of the following alternatives for disposal of waste electrolyte:

a. An industrial waste treatment plant, if available and approved by the Contracting Officer for neutralizing and disposing of battery acid electrolyte.

b. Transport the electrolyte to a state-approved hazardous waste disposal site. The method of transportation and equipment shall comply with applicable Federal and state regulations.

3.5.4 Pest Control

Where directed by the Contracting Officer, provisions shall be made for control of pests resulting from the Contractor's operations. Pest control measures to be taken by the Contractor shall be approved by the Contracting Officer before implementation. Pesticides shall not be allowed. All pest control methods shall be coordinated with the installation pest management authority.

3.5.5 Chemical Wastes

Chemical wastes shall be stored in corrosion resistant containers and removed from the project site, not less frequently than monthly unless directed otherwise.

a. Fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants to be discarded and waste oil shall be stored in

corrosion resistant containers, and disposed of as directed. The Contractor shall notify immediately of spills of oils, lubricants, or chemical wastes, which may violate Federal, State, local and Base regulation; see "Spills and Spill Reporting" article.

b. Chemical wastes shall be disposed of off Government property except as directed by the Contracting officer. Chemical wastes shall not be dumped onto the ground, into storm sewers or open water courses, or into the sanitary sewer systems.

3.6 DUST CONTROL

Keep dust down at all times, including during nonworking periods. Sprinkle or treat the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster. Do not use chemicals for slope protection nor dust control.

3.6.1 Slope Protection

The protection method shall be tailored to suit individual site requirements. Equipment selected for protecting application shall be based on individual site requirement, mulching material application rate, and the protection method. Protection methods include:

a. The application of vegetation in stages, dependent on the length of time for project completion, including accelerated growth of temporary annual grass (less than 1 year), a persistent perennial grass (more than 1 year), followed by a persistent, hardy perennial legume (2 or more years);

b. The application of organic mulch;

c. The application of binding agents;

d. The application of fabric or mats including jute, excelsior, woven paper, or plastic fibers;

3.7 NOISE

The maximum use of low noise emitting equipment as certified by the Environmental Protection Agency shall be made when available. At the project site, noise level shall not exceed 80 dba at 10 meters. No blasting or use of explosives will be permitted.

3.8 SPILLS AND SPILL REPORTING

The Contractor is responsible for cleaning-up any spills caused by the Contractor or its agents to the satisfaction of the 914th AFRES Environmental Office and at no cost to the government. Niagara Falls Air Reserve Station (NFARS) will be responsible for the disposal of any spill waste generated during the project and the Contractor will reimburse NFARS for the disposal costs of such wastes. NFARS will be considered to be the generator of such wastes for purposes of disposal. The Contractor will maintain spill equipment and materials sufficient to handle the containment and clean up of spills in the capacity of the project. The Contractor must immediately report any and all spills or leaks to the 914th AFRES Fire Department at 911. In the event of a spill, the following information will be reported:

- Description and amount of material spilled.
- Location of the spill (i.e., building number, street name, room

number, etc.)
- Name of the person reporting the spill (with location and telephone number where they can be reached)
- How the spill occurred
- The estimated time of the spill and the time the spill was discovered.
- What has been done to stop the spill and has any personnel been evacuated.
- What natural resources were effected. Did the spill affect any water resources or enter any storm or sanitary sewers?

PART 4 - PERMITS

4.1 PERMITS

General Contractor shall obtain all necessary permits as required by the agencies having jurisdiction prior to the start of work on this project. All permits or licenses and off-site location of the disposal area shall be provided prior to transporting material off Governmental property.

Specifically, the contractor shall file with the EPA at least 48 hours before starting construction a NPDES Notice of Intent form and comply with the requirements of the NPDES General Permit for Industrial Activities.

"Appendix H", an Erosion and Sedimentation Control Plan has been prepared for this project and is available from the Contracting Officer.

END OF SECTION 01560

Fire Training Facility Storm Water Pollution Prevention Plan
Inspection And Maintenance Report Forms

To be completed after every seven (7) Days and within 24 hours of a rainfall event of 0.5 inched or more. Portions of the construction area that have been finally stabilized shall be inspected at least once every month until the entire site is finally stabilized.

Inspector:_____ Date:_____

_____
_____
_____
_____

Days since last rainfall:_____ Amount of last rainfall (in.)_____

Area	Date since last disturbed	Date of next disturbance	Stabilized (Y/N)	Stabilized With	Condition
Swale Relocations					
Drainage Swales					
Training Area					
Roads					
Parking Areas					
Grassy Areas					
Storage Materials					

Stabilization Required:

_____
_____
_____
_____

To be performed by:_____ On or before:_____

Fire Training Facility Storm Water Pollution Prevention Plan Inspection And Maintenance Report Forms (continued)

Structural Controls

Areas	Condition	Evidence of Overtopping Embankment?	Depth of Sediment
Sediment Traps			
Sediment Basins			
Silt Fence			

Maintenance Required:

_____

_____

_____

_____

To be performed by:_____ On or before:_____

Other Controls
Stabilize Construction Entrance

Does Sediment get Tacked onto Road?	Is the Gravel Filled with Sediment?	Does all Traffic use the Stabilized Entrance to Leave the Site?	Is the Culvert beneath the Entrance Working?

Equipment Inspection/Spill Clean Up

Are Vehicles Leaking?	Is Other Equipment Leaking?	Are Spills Cleaned Up and Reported to the Fire Dept?	Is Spill Clean Up Material Available at the Site?

Maintenance Required:

_____

_____

_____

_____

To be performed by:_____ On or before:_____

Inspection of Outfalls and Drainage System

Appearance of Receiving Waters	Appearance of Drainage System after Controls	Are pollutants Entering the Drainage System?	Are Erosion Control Measures Effective?

Changes Required to the Pollution Prevention Plan:

_____

_____

_____

_____

Reason for Changes:

_____

_____

_____

_____

"I certify under penalty of law that this document and all attachment were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law."

Signature:_____ Date:_____

SECTION 01720
PROJECT RECORD DOCUMENT/HAZARDOUS MATERIALS REPORTING

The contractor shall maintain hazardous materials inventories and Materials Safety Data Sheets (MSDS) for all hazardous materials (as defined in 29 CFR 1910, 1200, 40 CFR's 355, 370 & 372) to be stored and used on this installation. Hazardous materials must be inventoried when received and at the project's completion. The amounts used shall be maintained for the project's duration, and for the calendar year (ending 31 December).

Hazardous Materials Inventories, Materials Safety Data Sheets, and materials quantities used shall be submitted to the Contracting Officer for approval.

The Project Submittals List shall include:

Hazardous Material Inventories
Materials Safety Data Sheets

SECTION C-01800

EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 General Requirements

The Contractor shall provide 6 complete copies of the Equipment Operating, Maintenance, and Repair Manuals. Separate manuals shall be provided for each utility system as defined hereinafter. Operations and Maintenance manuals shall be submitted and approved before field training or 90 days before substantial completion (whichever occurs earlier). An amount of $10,000 shall be withheld until submittal and approval of O&M manuals is complete.

1.3 Definitions

1.3.1 Equipment

A single piece of equipment operating alone or in conjunction with other equipment to accomplish a system function.

1.3.2 System

A combination of one or more pieces of equipment which function together to accomplish an intended purpose.

1.3.3 Hard Cover Binders

The manuals shall be hard cover with posts, or 3-ring binders, so sheets may be substituted easily. The following identification shall be printed on the cover: the words "EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS," the project name, building number, and an indication of utility or systems covered, the name of the Contractor, and the Contract number. Manuals shall be approximately 8-1/2 by 11-inches with large sheets folded in and capable of being easily pulled out for reference. All manuals for the project must be similar in appearance, and be of professional quality.

1.3.4 Warning Page

A warning page shall be provided to warn of potential dangers (if they exist, such as high voltage, toxic chemicals, flammable liquids, explosive materials, carcinogens, high pressures, etc.). The warning page shall be placed inside the front cover and in front of the title page. Also, any necessary Material Safety Data Sheets (MDSD) shall be included here.

1.3.5 Title Page

The title page shall include the same information shown on the cover and show the name of the preparing firm and the date of publication.

1.3.6 Table of Contents

Each volume of the set of manuals for this project shall include a table of contents, for the entire set, broken down by volume.

PART 2 PRODUCTS (Not Used.)

PART 3 EXECUTION

3.1 GENERAL

Manuals shall be organized according to the following format, and will include information for each item of equipment (NOTE: This includes any equipment which may have been omitted from the items listed in Paragraph 3.2, System/Equipment Requirements.) A draft outline and table of contents shall be submitted for approval at 50% contract completion.

TABLE OF CONTENTS

PART I. Introduction.

(a) Equipment Description.
(b) Functional Description.
(c) Installation Description.

PART II. Operating Principles.

PART III. Safety.

PART IV. Preventive Maintenance

(a) Preventive Maintenance Checklist. Lubrication
(b) Charts and Diagrams.

PART V. Spare Parts Lists

(a) Troubleshooting Guide
(b) Adjustments
(c) Common Repairs and Parts Replacement

PART VI. Illustrations

3.1.1 Part I-Introduction

Part I shall provide an introduction, equipment or system description, functional description and theory of operation, and installation instructions for each piece of equipment. Complete instructions for uncrating, assembly, connection to the power source and pre-operating lubrication shall be included

in the installation instructions as applicable. Illustrations, including wiring and cabling diagrams, are required as appropriate in this section. Halftone pictures of the equipment should be included in the introduction and equipment description, as well as system layout drawings with each item of equipment located and marked. Copies of previously submitted shop drawings shall not be used in these manuals.

3.1.2 Part II-Operating Principles

Part II shall provide complete instructions for operating the system, and each piece of equipment. Illustrations, halftone pictures, tables, charts, procedures, and diagrams are required when applicable. This will include step-by-step procedures for start-up and shutdown of both the system and each component piece of equipment, as well as adjustments required to obtain optimum equipment performance, and corrective actions for malfunctions. Performance sheets and graphs showing capacity data, efficiencies, electrical characteristics, pressure drops, and flow rates shall be shown here, also. Marked-up catalogs or catalog pages do not satisfy this requirements. Performance information shall be presented as concisely as possible and contain only data pertaining to equipment actually installed. Actual test data collected for Contractor performance shall be included here.

3.1.3 Part III-Safety

Part III shall contain the general and specific safety requirements peculiar to each item of equipment. Safety information should be repeated as notes cautions, and warnings in other sections where appropriate to operations described.

3.1.4 Part IV-Preventive Maintenance

Part IV shall contain a troubleshooting guide, including detailed instructions for all common adjustments and alignment procedures, including a detailed maintenance schedule. Also, include a diagnostic chart showing symptoms and solutions to problems. Include test hookups to determine the cause, special tools and test equipment, and methods for returning the equipment to operating conditions. Information may be in chart form or in tabular format with appropriate headings. Instructions shall be included for the removal, disassembly, repair, reassembly, and replacement of parts and assemblies where applicable and the task is not obvious.

3.1.5 Part V-Spare Parts List

Part V shall contain a tabulation of description data and parts location illustrations for all mechanical and electrical parts. The heading of the parts list shall clearly identify the supplier, purchase order number, and equipment. The unit price for each part shall be included, also. Parts shall be listed by major assemblies, and the listing shall be arranged in columnar form. Also, names and addresses of the nearest manufacturer's representatives will be included, as well as any special warranty information. A list of spare parts that are recommended to be kept in stock by the Government installation shall be provided.

3.1.6 Part VI-Illustrations

Part VI shall contain assembly drawings for the complete equipment or system and for all major components. Complete wiring diagrams and schematics shall be included. Other illustrations, such as exploded views, block diagrams, and cutaway drawings, are required as appropriate.

3.1.7 Framed Instructions

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted at a location near the equipment described. Condensed operating instructions explaining preventive maintenance procedures methods of checking the system for normal safe operation, valve schedule and procedures for safely starting and stopping the system shall be prepared in type form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. Proposed diagrams, instructions, and other sheets shall be submitted prior to posting. The framed instructions shall be posted before field training.

3.1.8 Field Training

Contractor shall conduct a training course for the operating staff for each particular system. The training period, a total of 24 hours of normal working time, shall start after the system is functionally completed. The filed instructions shall cover all of the items contained in the Equipment Operating, Maintenance and Repair Manuals. The training will include both classroom and "hands-on" training. The Contractor shall submit a lesson plan outlining the information to be discussed during training periods. This lesson plan will be submitted 90 days before contract completion and approved before the field training occurs. Training shall be videotaped on one-half inch VHS cassettes and shall be furnished to the Government within ten (10) days following training. Training shall be documented by the Contractor and a list of attendees shall be furnished to the Government.

3.1.9 Spare Parts List

The following list of spares shall be provided by the Contractor and turned over to the Contracting Officer. This is not an all-inclusive list as other items may be specifically required within the sections of the specification and are also to be included.

6 ea. Ignitor Assys
- CH31723

6 ea. Pigtail Leads (CAPD)

#204085

Adeq. Fire Pit Splice Matls.

- Heat Shrink Tubing
- Teflon Tubing 6 mm 13 AWG
  5 mm 16 AWG
- RTV Adhesive
- Sn63 Solder

1 ea. N2 Gas in 244 ft3 Bottles

1 ea. COAX Pilot Valve

3 ea. Ignitor Switches
- Momentary
- Continuous

1 ea. Propane Lip/Vapor Regulators
- 5 to 25 psi
- 20 to 50 psi
- 40 to 120 psi

1 ea. Emergency Shut-off Switch

50 lf MIL-C-3702 Ignition Cable

END OF SECTION 01800

SECTION 02110

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 REFERENCES (Not Applicable)

1.2 DEFINITIONS

1.2.1 Clearing

Clearing shall consist of the satisfactory disposal of vegetation designated for removal, including snags, brush, and rubbish occurring in the areas to be cleared.

1.2.2 Grubbing

Grubbing shall consist of the removal and disposal of roots larger than 75 millimeters (3 inches) in diameter, and matted roots from the designated grubbing areas.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-18 Records

Materials Other Than Salable Timber; FIO

Written permission to dispose of such products on private property shall be filed with the Contracting Officer.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 CLEARING

Roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such vegetation as may be indicated or directed to be left standing. Vegetation to be left shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work.

3.2 GRUBBING

Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas

under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.3 DISPOSAL OF MATERIALS

3.3.1 Materials Other Than Salable Timber

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall be disposed of outside the limits of Government-controlled land in a lawful manner at the Contractor's responsibility.

3.3.2 Unsalvageable Materials

Concrete and other demolished materials shall be disposed of outside the limits of Government-controlled land, at the Contractor's responsibility.

3.4 CLEAN-UP

Debris and rubbish shall be removed and transported in a manner that prevents spillage on adjacent areas or roads/streets. Local regulations regarding hauling and disposal shall apply.

END OF SECTION 02110

SECTION 02210

GRADING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft.)
ASTM D 2167	(1984; R 1990) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1992) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Materials classified in ASTM D 2487 as GM, GC, GW, GP, SP, SM, SC, ML, MH, CL and SW, and free from roots and other organic matter, trash, debris, and frozen materials and stones larger than 6 inches in any dimension are satisfactory. MH materials shall be considered satisfactory only when they (1) are utilized in accordance with the moisture control requirements of Section 02221 - EXCAVATION FILLING AND BACKFILLING FOR BUILDINGS - paragraph 3.14.2, Moisture Content, (2) meet the specified density requirements after compaction and (3) are not utilized to a depth of at least 18 inches from the finished surface of all subgrades designated to receive pavements or shoulders. MH materials which do not meet all of the above requirements shall be considered as unsatisfactory and shall be removed from the site and/or reworked to comply with the requirements of these specifications.

1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Materials classified in ASTM D 2487 as Pt, OH, and OL are unsatisfactory.

1.2.3 Cohesionless and Cohesive Materials

Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

1.2.4 Degree of Compaction

Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated below as a percent of laboratory maximum density.

1.2.5 Topsoil

Material obtained from offsite areas and excavations suitable for topsoils, is defined as natural friable soil, characteristic of representative soils in the vicinity that produce heavy growths of crops, grass, and other vegetation. Topsoil shall be free from roots, stones, and other materials larger than 1 inch in any dimension that hinder grading, planting and maintenance operations, and free from objectionable weed seeds and toxic substances and any substance which may be harmful to plant growth. The pH shall be from 5.3 to 6.0.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-08 Statements

Field Testing Control; FIO.

Qualifications of the commercial testing laboratory who will be performing all testing in accordance with paragraph FIELD TESTING CONTROL.

SD-09 Reports

Field Testing Control; FIO. Satisfactory Materials; FIO.

Certified test reports and analysis certifying that the satisfactory materials proposed for use at the project site conform to the specified requirements, and for all tests conducted in accordance with paragraph FIELD TESTING CONTROL.

1.4 SUBSURFACE DATA

Subsurface soil boring logs are shown on the drawings. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

PART 2 PRODUCTS

2.1 BORROW MATERIAL

Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by th Contractor as incidental operations to the borrow excavation.

2.1.1 Selection

Borrow materials shall be obtained from sources outside the limits of Government-controlled land. Contractor shall verify existence of and may use stockpiled material on Government property from previous construction activity on the base. Borrow materials shall be subject to approval. The source of borrow material shall be the Contractor's responsibility. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, shall pay all royalties and other charges involved, and shall bear all the expense of developing the sources, including rights-of-way for hauling.

2.1.2 Borrow Pits

Except as otherwise permitted, borrow pits shall be excavated to afford adequate drainage. Overburden and other spoil material shall be disposed of or used for special purposes. Borrow pits shall be neatly trimmed after the excavation is completed.

PART 3 EXECUTION

3.1 CONSERVATION OF TOPSOIL

Topsoil shall be removed to full depth and shall be stored separate from other excavated materials and piled free of roots, stones, and other undesirable materials. Any surplus of topsoil from excavations and grading shall be removed from the site.

3.2 EXCAVATION

After topsoil removal has been completed, excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades indicated. Satisfactory excavation material shall be transported to and placed in fill areas within the limits of the work. All unsatisfactory material and surplus material shall be removed from the site. In the event that it is necessary to remove unsatisfactory material to a depth greater than specified, the Contracting Officer shall be notified and an adjustment in the contract price will be considered in accordance with the contract. Excavations carried below the depths indicated, without specific directions, shall, except as otherwise specified, be refilled to the proper grade with satisfactory material as directed. All additional work of this nature shall be at the Contractor's expense. Excavation and filling shall be performed in a manner and sequence that will provide drainage at all times.

Excavations shall be kept free from water while construction therein is in progress. Material required for fills in excess of that produced by excavation within the grading limits shall be obtained from borrow areas.

3.3 DITCHES, GUTTERS, AND CHANNEL CHANGES

Ditches, gutters, and channel changes shall be cut accurately to the cross sections and grades indicated. All roots, stumps, rock, and foreign matter in the sides and bottom of ditches, gutters, and channel changes shall be trimmed and dressed or removed to conform to the slope, grade, and shape of the section indicated. Care shall be taken not to excavate ditches and gutters below the grades indicated. Excessive ditch and gutter excavation shall be backfilled to grade either with satisfactory, thoroughly compacted material or with suitable stone or cobble to form an adequate gutter paving as directed. All ditches and gutters excavated under this section shall be maintained until final acceptance of the work. Satisfactory material excavated from ditches and channel changes shall be placed in fill areas. Unsatisfactory and excess excavated material shall be disposed of in accordance with directions in paragraph EXCAVATION. No excavated material shall be deposited closer to the edges of the ditches than indicated and in no case less than 3 feet.

3.4 BACKFILL ADJACENT TO STRUCTURES

Backfill adjacent to structures shall be placed and compacted uniformly in such manner as to prevent wedging action or eccentric loading upon or against the structures. Slopes bounding or within areas to be backfilled shall be stepped or serrated to prevent sliding of the fill. During backfilling operations and in the formation of embankments, equipment that will overload the structure in passing over and compacting these fills shall not be used. Backfill for storm drains and subdrains, including the bedding and backfill for structures other than culverts and drains, shall conform to the additional requirements in other applicable sections.

3.5 PREPARATION OF GROUND SURFACE FOR FILL

All vegetation, such as roots, brush, heavy sods, heavy growth of grass, and all decayed vegetable matter, rubbish, and other unsatisfactory material within the area upon which fill is to be placed, shall be stripped or otherwise removed before the fill is started. In no case will unsatisfactory material remain in or under the fill area. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed shall be plowed, stepped, or broken up, as directed, in such manner that the fill material will bond with the existing surface. Prepared surfaces on which compacted fill is to be placed shall be wetted or dried as may be required to obtain the specified moisture content and density.

3.6 FILLS AND EMBANKMENTS

Fills and embankments shall be constructed at the locations and to lines and grades indicated. The completed fill shall conform to the shape of the typical sections indicated or shall meet the requirements of the particular case. Satisfactory material obtained during excavation may be used in forming required fill. Fill shall be satisfactory material and shall be reasonably free from roots, other organic material, and trash and from stones having a maximum diameter greater than 6 inches. No frozen material will be permitted in the fill. Stones having a dimension greater than 3 inches shall not be permitted in the upper 6 inches of fill or embankment. The material shall be placed in successive horizontal layers of 6 inches in loose depth for the full width of the cross section and shall be compacted as specified. Each layer shall be compacted before the overlaying lift is placed. Moisture content of the fill or backfill material shall be adjusted by wetting or aerating, as required, to within

plus or minus 2 percent of optimum moisture content as determined from laboratory tests specified in paragraph DEFINITIONS.

3.7 COMPACTION

Except for paved areas, each layer of the fill or embankment shall be compacted to at least 90 percent of laboratory maximum density. Areas to be paved and other areas indicated as requiring compaction suitable for paved areas shall be compacted to at least the percentage of laboratory maximum density shown in the following tabulation for specific ranges of depth below the surface of the pavement:

Dept Below Pavement Surface	Percentage of Laboratory Maximum Density Required			
	Fill Cohesive Materials	Fill Cohesionless Materials	Cut Cohesive Materials	Cut Cohesionless Materials
12 in	90	95	90	95

3.8 FINISHED EXCAVATION, FILLS, AND EMBANKMENTS

All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth-graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from blade-grader operations, except as otherwise specified. Ditches and gutters shall be finished to permit adequate drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials. For subgrade areas to be paved, the following shall be accomplished as required: (a) soft or otherwise unsatisfactory material shall be replaced with satisfactory excavated material or other approved materials; (b) rock encountered in the cut sections shall be excavated to a depth of 6 inches below finished grade for the subgrade; (c) low areas resulting from removal of unsatisfactory material or from excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and shall be compacted as specified. The surface of embankments or excavated areas for road construction or other areas on which a base course or pavement is to be placed shall vary not more than 0.05 foot from the established grade and approved cross section. Surfac other than those that are to be paved shall be finished not more than 0.15 foot above or below the established grade or approved cross section.

3.9 PLACING TOPSOIL

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 2-inch depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness of 3 inches and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from off-site areas.

3.10 FIELD TESTING CONTROL

Testing shall be the responsibility of the Contractor and shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Field density and moisture content tests shall be performed on every 5,000 square feet of each lift placed. Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2167.

3.11 PROTECTION

Newly graded areas shall be protected from traffic and from erosion, and any settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes. All work shall be conducted in accordance with the environmental protection requirements of the contract.

END OF SECTION 02210

SECTION 02221

EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil, and Rock
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.2 DEFINITIONS

1.2.1 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated hereinafter as percent laboratory maximum density.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-09 Reports

Field Density Tests; FIO.

Testing of Backfill Materials; FIO.

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials include materials classified in ASTM D 2487 as GW, GP, SW, SP, SM, GM, SC, GC, CL, ML and MH and shall be free of trash, debris, roots or other organic matter, or stones larger than 3 inches in any dimension.

2.1.2 Unsatisfactory Materials

Unsatisfactory materials include materials classified in ASTM D 2487 as Pt, OH, OL, and any other materials not defined as satisfactory.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

2.1.4 On Site Materials

Bidders are urged to examine the data presented and to visit the site to observe existing conditions. Soil boring logs typically indicate stiff brown silty clay present throughout the site. Placement of this material often requires moisture control procedures to obtain satisfactory compaction. It will be the responsibility of the Contractor to handle such material in accordance with these specifications at no additional cost to the Government.

2.2 CAPILLARY WATER BARRIER

Capillary Water Barrier shall consist of clean, crushed, nonporous rock, crushed gravel, or uncrushed gravel. The maximum particle size shall be 1-1/2 inches and no more than 2 percent by weight shall pass the No. 4 size sieve.

PART 3 EXECUTION

3.1 CLEARING AND GRUBBING

Clearing and grubbing is specified in Section 02110 CLEARING AND GRUBBING. The areas within lines 5 feet outside of each building and structure line shall be cleared and grubbed of trees, stumps, roots, brush and other vegetation, debris, existing foundations, pavements, utility lines, structures, fences, and other items that would interfere with construction operations. Stumps, logs, roots, and other organic matter shall be completely removed and the resulting depressions shall be filled with satisfactory material, placed and compacted in accordance with paragraph FILLING AND BACKFILLING. Materials removed shall be disposed of outside the limits of Government-controlled property at the Contractor's responsibility.

3.2 TOPSOIL

Topsoil shall be stripped to a depth of 6 inches below existing grade within the designated excavations and grading lines and deposited in storage piles for later use. Excess topsoil shall be disposed as specified for excess excavated material.

3.3 EXCAVATION

Excavation shall conform to the dimensions and elevations indicated for each building, structure, and footing except as specified hereinafter, and shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the building line of each building and structure, and all work incidental thereto. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be

removed as directed and replaced with satisfactory material. Satisfactory material removed below the depths indicated without specific direction of the Contracting Officer shall be replaced at no additional cost to the Government to the indicated excavation grade with satisfactory materials, except that concrete footings shall be increased in thickness to the bottom of the overdepth excavations and over-break in rock excavation. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.4 DRAINAGE AND DEWATERING

3.4.1 Drainage

Surface water shall be directed away from excavation and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site and the area immediately surrounding the site and affecting operations at the site shall be continually and effectively drained.

3.4.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 3 feet below the working level.

3.5 SHORING

Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures and utilities. Shoring bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving. The Contractor shall refer to EM385-1-1 (Safety and Health Requirements Manual) for the minimum requirements for protection of employees who may be exposed to moving ground or cave in.

3.6 CLASSIFICATION OF EXCAVATION

Excavation will be unclassified regardless of the nature of material encountered.

3.7 BLASTING

Blasting will not be permitted.

3.8 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if

necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length.

3.9 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained as specified in Section 02210 GRADING.

3.10 EXCAVATED MATERIALS

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Section 02210 GRADING.

3.11 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before concrete is to be placed.

3.12 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified in paragraph FILLING AND BACKFILLING.

3.13 FILLING AND BACKFILLING

Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials. Satisfactory materials shall be placed in horizontal layers not exceeding 8 inches in loose thickness, or 6 inches when hand-operated compactors are used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade and shall include backfill for underground fuel tanks. Backfill shall not be placed in wet or frozen areas. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and 1 foot above

other utility lines shall be free from stones larger than 1 inch in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum density specified below:

	Percent Laboratory maximum density	
	Cohesive material	Cohesionless material
Fill, embankment, and backfill		
Under structures, building slabs, steps, paved areas, around footings, and in trenches	90	95
Under sidewalks and grassed areas	85	90
Subgrade		
Under building slabs, steps, and paved areas, top 12 inches	90	95
Under sidewalks, top 6 inches	85	90

Approved compacted subgrades that are disturbed by the Contractor's operations or adverse weather shall be scarified and compacted as specified herein before to the required density prior to further construction thereon. Recompaction over underground utilities and heating lines shall be by hand tamping. For compacted subgrades and/or any lift of fill or backfill that fails to meet the specified density requirement, the entire subgrade and/or entire lift of fill shall be broken up to a minimum depth of 9 inches, pulverized, and recompacted to the specified density, even if this action requires the removal and replacement of subsequently placed satisfactory lifts of fill. Lifts of fill placed without being field density tested will not be accepted as satisfactory under any circumstances.

3.14 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed by a soils engineer licensed to practice in Massachusetts. Field in-place density shall be determined in accordance with ASTM D 1556. Use of a penetrometer to determine bearing capacity is acceptable. The following number of tests, if performed at the appropriate time, shall be the minimum acceptable for each type operation.

3.14.1 In-Place Densities

3.14.1.1 In-Place Density of Subgrades

One test per 5,000 square foot or fraction thereof.

3.14.1.2 In-Place Density of Fills and Backfills

One test per 2500 square foot or fraction thereof of each lift for fill or backfill areas compacted by other than hand or hand-operated machines. The density for each lift of fill or backfill materials for trenches, pits, building perimeters or other structures or areas less than 75 feet in width, which are compacted with hand or hand-operated machines shall be tested as follows: One test per each area less than 1000 square feet, or one test for each 100 linear foot of long narrow fills 50 feet or more in length.

3.14.2 Moisture Content

In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of materials being placed is required during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions and approved moisture content shall be tested in accordance with ASTM D 2216.

3.14.3 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 2000 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density will be made.

3.15 CAPILLARY WATER BARRIER

Capillary water barrier under concrete floor and area-way slabs on grade shall be placed directly on the subgrade and shall be compacted with a minimum of two passes of a hand-operated plate-type vibratory compactor.

3.16 GRADING

Areas within 5 feet outside of each building and structure line shall be constructed true-to-grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted.

3.17 SPREADING TOPSOIL

Areas outside the building lines from which topsoil has been removed shall be topsoiled. The surface shall be free of materials that would hinder planting or maintenance operations. The subgrade shall be pulverized to a depth of 2 inches by disking or plowing for the bonding of topsoil with the subsoil. Topsoil shall then be uniformly spread, graded, and compacted to the thickness, elevations, slopes shown, and left free of surface irregularities. Topsoil shall be compacted by one pass of a cultipacker, roller, or other approved equipment weighing 100 to 160 pounds per linear foot of roller. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to seeding, planting, or proper grading.

3.18 PROTECTION

Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work shall be repaired and grades reestablished to the required elevations and slopes.

3.19 EXISTING UNDERGROUND ELECTRICAL LINES

An existing 4800-volt underground electric line passes under the proposed location of the stabilized aggregate surface, southwest of the proposed burn pit anchor location.

This existing underground electric line shall remain throughout construction with minimal crossings of proposed utilities. Therefore at these locations, the underground electrical line shall be carefully exposed and field verified as to location, elevation and prominently staked out prior to installation of utilities.

END OF SECTION 02221

SECTION 02222

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System

1.2 DEFINITIONS

1.2.1 Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-09 Reports

Testing of Backfill Materials; FIO.

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials shall consist of any material classified by ASTM D 2487 as GM, GW, GP, GC, SP, SM, CL, ML, SC and SW. Lime and flyash shall also be considered as satisfactory materials when used as stabilizing agents.

2.1.2 Unsatisfactory Materials

Unsatisfactory materials shall be materials that do not comply with the requirements for satisfactory materials. Unsatisfactory materials include but are not limited to those materials containing roots and other organic matter, trash, debris, frozen materials and stones larger than 3 inches, and materials classified in ASTM D 2487, as CH, MH, PT, OH, and OL. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

2.1.4 On-Site Materials

Bidders are urged to examine the data presented and to visit the site to observe existing conditions. Soil boring logs typically indicate stiff brown silty clay present throughout the site. Placement of this material often requires moisture control procedures to obtain satisfactory compaction. It will be the responsibility of the Contractor to handle such material in accordance with these specifications at no additional cost to the Government.

2.1.5 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a No. 200 mesh sieve and 100 percent by weight passing the l inch sieve.

2.1.6 Initial Backfill Material

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 3 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, the initial backfill material shall be free of stones larger than 2-1/2 inches in any dimension or as recommended by the pipe manufacturer, whichever is maller.

2.1.7 Plastic Marking Tape

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable

detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Red:	Electric
Yellow:	Gas, Oil, Dangerous Materials
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Blue:	Water Systems
Green:	Sewer Systems

2.2 EQUIPMENT

2.2.1

The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations, trenches or other parts of the work.

PART 3 EXECUTION

3.1 EXCAVATION

Excavation shall be performed to the lines and grades indicated. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 2 feet. Excavated material not required or not satisfactory for backfill shall be removed from the site. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed to maintain the stability of the bottom and sides of the excavation. Unauthorized overexcavation shall be backfilled in accordance with paragraph BACKFILLING AND COMPACTION at no additional cost to the Government.

3.1.1 Trench Excavation

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than 4 feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Vertical trench walls more than 4 feet high shall be shored. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter and shall not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by

the Contractor without any additional cost to the Government. The Contractor shall refer to EM385-1-1 (Safety and Health Requirements Manual) for the minimum requirements for protection of employees who may be exposed to moving ground or cave in.

3.1.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

3.1.1.2 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the fault or neglect of the Contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

3.1.1.3 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.1.1.4 Jacking, Boring, and Tunneling

Unless otherwise indicated, excavation shall be by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly compacted in such sections.

3.1.1.5 Stockpiles

Stockpiles of satisfactory and wasted materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government.

3.1.2 Dewatering

Each excavation shall be kept dry during subgrade preparation and continually

thereafter until the structure to be built, or the pipe to be installed therein is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result. All excavations for concrete structures or trenches which extend down to or below ground water shall be dewatered by lowering and keeping the ground water level beneath such excavations 12 inches or more below the bottom of the excavation. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property. Existing drainage facilities may be used for disposal of surface and ground water during dewatering operations subject to prior approval of the Contracting Officer. The Contractor shall be responsible for all damages incurred to the drainage facilities as a result of the dewatering operations. All pipes and conduit shall be left clean and free of sediment.

3.2 BACKFILLING AND COMPACTION

Backfill material shall consist of satisfactory material, select granular material, or initial backfill material as required. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils, unless otherwise specified.

3.2.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The trench shall be backfilled to 2-1/2 feet above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test. The trench shall not be backfilled until all specified tests are performed.

3.2.1.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material, in layers not exceeding 6 inches loose thickness.

3.2.1.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

3.2.1.3 Bedding and Initial Backfill

Bedding shall be select granular material. Initial backfill material shall be placed and compacted with approved tampers to a height of at least 1 foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

3.2.1.4 Final Backfill

The remainder of the trench, except for special materials for driveways and parking areas shall be filled with satisfactory material. Backfill material shall be placed and compacted as follows:

a. Driveways and Parking Areas: Backfill shall be placed up to the elevation at which the requirements in Section 02225 EARTHWORK FOR

DRIVEWAYS AND PARKING AREAS control. Water flooding or jetting methods of compaction will not be permitted.

b. Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inch loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

3.2.2 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for three days, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.3 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.3.1 Gas Distribution

Trenches shall be excavated to a depth that will provide not less than 24 inches of cover in the excavation. Trenches shall be graded as specified for pipe-laying requirements in Mechanical Section.

3.3.2 Electrical Distribution System

Direct burial cable and conduit or duct line shall have a minimum cover of 24 inches from the finished grade, unless otherwise indicated. Special trenching requirements for direct-burial electrical cables and conduits are specified in Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

3.3.3 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 18 inches below finished grade unless otherwise shown.

3.4 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

3.4.1 Testing Facilities

Tests shall be performed by an approved commercial testing laboratory or may be tested by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the first inspection will be charged to the Contractor.

3.4.2 Testing of Backfill Materials

Characteristics of backfill materials shall be determined in accordance with particle size analysis of soils ASTM D 422 and moisture-density relations of soils ASTM D 1557. A minimum of one particle size analysis and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.

3.4.3 Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 200 feet of installation shall be performed. One moisture density relationship shall be determined for every 1500 cubic yards of material used. Field in-place density shall be determined in accordance with ASTM D 1556. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

3.4.4 Displacement of Sewers

After other required tests have been performed and the trench backfill compacted to the finished grade surface, the pipe shall be inspected to determine whether significant displacement has occurred. This inspection shall be conducted in the presence of the Contracting Officer. Pipe sizes larger than 36 inches shall be entered and examined, while smaller diameter pipe shall be inspected by shining a light or laser between manholes or manhole locations, or by the use of television cameras passed through the pipe. If, in the judgment of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed at no additional cost to the Government.

END OF SECTION 02222

SECTION 02225

EARTHWORK FOR DRIVEWAYS AND PARKING AREAS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136 (1992) Sieve Analysis of Fine and Coarse Aggregates

ASTM D 422 (1963; R 1990) Particle-Size Analysis of Soils

ASTM D 1140 (1992) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve

ASTM D 1556 (1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D 1557 (1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))

ASTM D 2487 (1992) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D 4318 (1984) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-08 Statements

Earthwork; GA

Procedure and location for disposal of unused satisfactory material. Proposed source of borrow material.

SD-09 Reports

Testing; GA

Within 24 hours of conclusion of physical tests, three copies of test results, including calibration curves and results of calibration tests.

SD-13 Certificates

Testing; GA

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

SD-18 Records

Earthwork; GA

Advance notice on the opening of excavation or borrow areas.

1.3 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

1.4 BLASTING

Blasting will not be permitted.

1.5 UTILIZATION OF EXCAVATED MATERIALS

All unsatisfactory materials removed from excavations shall be disposed of off Government-controlled land. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material storage or designated waste areas as directed. No excavated material shall be disposed of in such a manner as to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project, to the lines, grades, and elevations indicated and as specified herein. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of in areas approved for surplus material storage or designated waste areas. Unsatisfactory excavated material shall be disposed of off Government-controlled land. During construction, excavation and fill

shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from approved private sources off government controlled lands.

3.1.1 Ditches, Gutters, and Channel Changes

Excavation of ditches, gutters, and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Care shall be taken not to excavate ditches and gutters below grades shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory thoroughly compacted material or with suitable stone or cobble to grades shown at no additional cost to the Government. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 1200 mm (4 feet) from the edge of a ditch. The Contractor shall maintain all excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.1.2 Drainage Structures

Excavations shall be made accurately to the lines, grades, and elevations shown or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.2 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from approved private sources selected by the Contractor. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay all royalties and other charges involved, and bear all expense of developing the sources, including rights-of-way for hauling. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation and shall be performed by the Contractor at no additional cost to the Government.

3.3 BACKFILL

Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials, in such a manner as to prevent wedging action or eccentric loading upon or against any structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, EMBANKMENTS, and SUBGRADE PREPARATION, below and Section 02222, EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the material being compacted.

3.4 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the material being compacted. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

3.5 SUBGRADE PREPARATION

3.5.1 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Low areas resulting from removal of unsatisfactory material shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. After rolling, the surface of the subgrade for roadways shall not show deviation greater than 0.5 inch when tested with a 10-foot straightedge applied both parallel and at right angles to the centerline of the area. The elevation of the finished subgrade shall not vary more than 0.05 foot from the established grade and cross section.

3.5.2 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the type of material being compacted.

3.5.2.1 Subgrade for Pavements

Subgrade for pavements shall be compacted to at least 95 percent laboratory maximum density for the depth below the surface of the pavement shown.

3.6 FINISHING

The surface of all excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for all graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION above. Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

3.7 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or may be tested by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's

facilities have been inspected and approved by the Contracting Officer. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspections required because of failure of the first inspection will be charged to the Contractor. Field in-place density shall be determined in accordance with ASTM D 1556. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements, at no additional expense to the Government. Tests on recompacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.7.1 Fill and Backfill Material Gradation

One test per 250 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM D 422.

3.7.2 In-Place Densities

a. One test per 5000 square feet or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

b. One test per 1500 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.

c. One test per 100 linear feet, or fraction thereof, of each lift of backfill for roads.

3.7.3 Moisture Contents

In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.

3.7.4 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 250 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.7.5 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

3.8 SUBGRADE PROTECTION

During construction, excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained in such a manner as to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted.

No pavement shall be laid until the subgrade has been checked and approved, and in no case shall pavement be placed on a muddy, spongy, or frozen subgrade.

End of Section 02225

SECTION 02233

SURFACE COURSE AND BURN PIT AGGREGATE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29	(1991a) Unit Weight and Voids in Aggregate
ASTM C 88	(1990) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1990) Materials Finer Than No. 200 Sieve in Mineral Aggregates by Washing
ASTM C 131	(1989) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1992) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-1bf/cu. ft.
ASTM D 2167	(1984; R 1990) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1992) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

ASTM D 4318	(1984) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1987) Wire-Cloth Sieves for Testing Purposes
ASTM E 548	(1991) General Criteria Used for Evaluating Laboratory Competence

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-09 Reports

Sampling and testing; FIO.

Copies of field test results.

1.3 DEGREE OF COMPACTION

Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557. This will be abbreviated herein as percent of laboratory maximum density. The surface course material in the burn pit shall be uncompacted, except that the top 4 inches shall be compacted with tampers.

1.4 EQUIPMENT

1.4.1 Approval

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

1.4.2 Weather Limitation

Base courses shall be placed when the atmospheric temperature is above 35 degrees F. Areas of completed base course that are damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirement.

1.5 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor subject to approval. If the Contractor elects to establish testing facilities of his own, approval of such

facilities shall be based on compliance with ASTM E 548, and no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved. The first inspection of the facilities shall be at the expense of the Government and any subsequent inspections required because of failure of the first inspection will be at the expense of the Contractor. Such costs will be deducted from the total amount due the Contractor. The materials shall be tested to establish compliance with the specified requirements. Copies of test results shall be furnished to the Contracting Officer.

1.5.1 Sampling

Sampling for material gradation, liquid limit, and plastic limit tests shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.5.2 Tests

The following tests shall be performed in conformance with the applicable standards listed.

1.5.2.1 Sieve Analyses

Sieve analyses shall be made in conformance with ASTM C 117 and ASTM C 136. Sieves shall conform to ASTM E 11.

1.5.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.5.2.3 Density Tests

Density shall be measured in the field in accordance with ASTM D 1556, ASTM D 2167 or ASTM D 2922. For the method presented in ASTM D 1556 the base plate as shown in the drawing shall be used. For the method presented in ASTM D 2922 the calibration curves shall be checked and adjusted if necessary using only the sand cone method as described in paragraph Calibration of the ASTM publication. Tests performed in accordance with ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration of ASTM D 2922, on each different type of material being tested at the beginning of a job and at intervals as directed.

1.5.2.4 Soundness Test

Soundness tests shall be made in conformance with ASTM C 88.

1.5.2.5 Wear Test

Wear tests shall be made in conformance with ASTM C 131.

1.5.3 Approval of Material

The source of the material to be used for producing aggregates shall be selected 30 days prior to the time the material will be required in the work. Tentative approval of the source will be based on an inspection by the Contracting Officer. Tentative approval of material will be based on tests of samples for the specific job. Final approval of both the source and the material will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted surface course.

PART 2 PRODUCTS

2.1 AGGREGATES

Aggregates shall consist of clean, sound, durable particles of crushed stone, crushed slag, or crushed gravel, and screenings. The Contractor shall obtain materials that meet the specification and can be used to meet the grade and smoothness requirements specified herein, after all compaction operations have been completed. Slag shall be an air-cooled, blast-furnace product having a dry weight of not less than 65 pcf as determined by ASTM C 29. The aggregates shall be free of silt and clay as defined by ASTM D 2487, vegetable matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve shall be known as coarse aggregate; that portion passing the mm No. 4 sieve shall be known as fine aggregate.

2.1.1 Coarse Aggregates

Coarse aggregates shall be angular particles of uniform density. The coarse aggregate shall have a loss not greater than 18 percent weighted averaged at five cycles when tested for soundness in magnesium sulfate in accordance with ASTM C 88. The coarse aggregate shall have a percentage of wear not to exceed 40 after 500 revolutions as determined by ASTM C 131. The percentage of flat and/or elongated particles shall not exceed 20 in the fraction retained on the 1/2 inch sieve and in the fraction passing the 1/2 inch sieve. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the requirements set forth herein. Crushed gravel shall be manufactured from gravel particles 90 percent of which by weight are retained on the maximum-size sieve listed in TABLE I. In the portion retained on each sieve specified, the crushed gravel shall contain at least 90 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the place. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces.

2.1.2 Fine Aggregate

Fine aggregate shall be angular particles produced by crushing stone, slag, or gravel that meets the requirements for wear and soundness specified for coarse aggregate. Fine aggregate shall be produced by crushing only particles larger than No. 4 sieve in size. The fine aggregate shall contain at least 90 percent by weight of particles having two or more freshly fractured faces in the portion passing the No. 4 sieve and retained on the No. 10 sieve, and in the portion passing the No. 10 sieve and retained on the No. 40) sieve.

2.1.3 Aggregate Surface Gradation Requirements

Gradation requirements specified herein shall apply to the completed base course. The aggregates shall have a maximum size of 1-1/2 inches) and be graded continuously well within the limits specified in TABLE I or in conformity with material designation M2.01.1 of the Massachusetts Dept. of Transportation. Sieves shall conform to ASTM E 11.

TABLE I. GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	No. 1	No. 2	No. 3
2 inch	100	--	--
1-1/2 inch	70-100	100	--
1 inch	45-80	60-100	100
1/2 inch	30-60	30-65	40-70
No. 4	20-50	20-50	20-50
No. 10	15-40	15-40	15-40
No. 40	5-25	5-25	5-25
No. 200	0-10	0-10	0-10

NOTE 1: Particles having diameters less than 1/2 inch shall not be in excess of 3 percent by weight of the total sample tested.

NOTE 2: The values are based on aggregates of uniform specific gravity, and the percentages passing the various sieves may require appropriate correction by the Contracting Officer when aggregates of varying specific gravities are used.

2.1.4 Burn Pit Aggregate

Burn pit aggregate requirements specified herein shall comply with the requirements above, except that the stone shall be 100% crushed with 100% passing the 2-inch sieve and 0% passing the 1-1/2 inch sieve.

2.1.5 Liquid Limit and Plasticity Index

Liquid limit and plasticity index requirements stated herein shall apply to any aggregate component that is blended to meet the required gradation and also to the aggregate in the completed surface course and burn pit aggregate layer. The portion of the aggregate passing the No. 40 sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

PART 3 EXECUTION

3.1 OPERATION OF AGGREGATE SOURCES

Clearing, stripping, and excavating shall be the responsibility of the Contractor. The aggregate sources shall be operated in such a manner as to produce the quantity and quality of base course materials meeting these specification requirements in the specified time limits. Upon completion of the work, the aggregate sources on Government reservations shall be conditioned to drain readily and be left in a satisfactory condition. Aggregate sources on private lands shall be conditioned in agreement with

local laws or authorities.

3.2 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Contracting Officer so as to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

3.3 PREPARATION OF UNDERLYING COURSE

Prior to constructing the surface course, the underlying course shall be cleaned of all foreign substances. At the time of construction of the surface course, the underlying course shall contain no frozen material. The underlying course shall conform to Section 02225 EARTHWORK FOR DRIVEWAYS AND PARKING AREAS. Ruts or soft, yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses containing sands or gravels as defined in ASTM D 2487 the surface shall be stabilized prior to placement of the surface course. Stabilization shall be accomplished by mixing surface material into the underlying course and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements of the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the base course is placed.

3.4 GRADE CONTROL

During construction, the lines and grades including crown and cross slope indicated for the base course shall be maintained by means of line and grade stakes placed by the Contractor.

3.5 MIXING OF MATERIALS

The coarse and fine aggregates shall be mixed in a stationary plant, or in a traveling plant or bucket loader on an approved paved working area. The Contractor shall make such adjustments in mixing procedures or in equipment as may be directed to obtain true grades, to minimize segregation or degradation, to obtain the required water content, and to insure a satisfactory base course meeting all requirements of this specification.

3.6 PLACING

The mixed material shall be placed on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. When a compacted layer 6 inches or less in thickness is required, the material shall be placed in a single layer. When a compacted layer in excess of 6 inches is required, the material shall be placed in layers of equal thickness. No layer shall exceed 6 inches or be less than 3 inches when compacted. The layers shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the surface course is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true

grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable surface course.

3.7 COMPACTION

3.7.1 Requirements

3.7.1.1 Surface Course

Each layer of surface course including shoulders shall be compacted as specified to produce an average field-measured density, through the full depth, of at least 100 percent of laboratory maximum density obtained in the laboratory. Water content shall be maintained during the compaction procedure and subsequent proof rolling of designated areas such that the water content is within plus or minus 3 percent of optimum water content as determined from laboratory tests as specified in density test procedures listed in paragraph SAMPLING AND TESTING. In all places not accessible to the rollers, the surface course material shall be compacted with mechanical tampers.

3.7.1.2 Burn Pit Aggregate

The crushed stone placed in the burn pit shall be uncompacted, except the top 4 inches shall be compacted to produce a surface to comply with the smoothness test as stated below.

3.7.2 Finishing

The surface of top layer of surface course shall be finished after final compaction, by cutting any overbuild to grade and rolling with a steel-wheeled roller. In no case will thin layers of material be added to the top layer of surface course to meet grade. If the elevation of top layer of surface course is 1/2 inch or more below the grade, the top layer of surface shall be scarified to a depth of at least 3 inches, new material shall be added, and the layer shall be blended and recompacted to bring to grade. Adjustments in rolling and finishing procedures shall be made as may be directed to obtain grades, to minimize segregation and degradation of surface course material, to adjust the water content, and to insure an acceptable surface course. Material found unacceptable shall be removed and replaced, as directed, with acceptable material.

3.8 EDGES OF SURFACE COURSE

Acceptable material shall be placed along the edges of the surface course in such quantity as will compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, at least a 1-foot width of the shoulder shall be rolled and compacted simultaneously with the rolling and compacting of each layer of the surface course, as directed.

3.9 SMOOTHNESS TEST

The surface of the top layer shall not deviate more than 3/8 inch when tested with a 10-foot straightedge applied parallel with and at right angles to the centerline of the area to be paved. Deviations exceeding 3/8 inch shall be corrected as directed.

3.10 THICKNESS CONTROL

The completed thickness of the surface course shall be within 1/2 inch of the thickness indicated. The thickness of the surface course shall be measured at

intervals providing at least one measurement for at least each 500 square yards of surface course. The depth measurement shall be made by test holes at least 3 inches in diameter. Where the measured thickness of the surface course is more than 1/2 inch deficient, such areas shall be corrected by excavating to the required depth and replacing with new material. Where the measured thickness of the surface course is 1/2 inch more than indicated, it will be considered as conforming with the requirements plus 1/2 inch, provided the surface of the surface course is within 1/2 inch of established grade. The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch of the thickness indicated.

3.11 MAINTENANCE

The surface course shall be maintained in a condition that will meet all specification requirements until accepted.

END OF SECTION 02233

SECTION 02511

CONCRETE SIDEWALKS AND CURBS AND GUTTERS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185	(1990a) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 615	(1990) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 616	(1990) Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A 617	(1990) Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM C 31	(1991) Making and Curing Concrete Test Specimens in the Field
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 171	(1991) Sheet Materials for Curing Concrete
ASTM C 172	(1990) Sampling Freshly Mixed Concrete
ASTM C 173	(1978) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 231	(1991b) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 309	(1991) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1992) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

CORPS OF ENGINEERS (COE)

COE CRD-C 527	(1988) Standard Specification for Joint Sealants, Cold-Applied, Non-Jet-Fuel-Resistant, for Rigid and Flexible Pavements

FEDERAL SPECIFICATIONS (FS)

FS CCC-C-467	(Rev C) Cloth, Burlap, Jute (or Kenaf)
FS SS-S-1401	(Rev C; Notice 1) Sealant, Joint, Non-Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Asphalt Concrete Pavements

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-09 Reports

Field Quality Control; FIO.

Copies of all test reports within 24 hours of completion of the test.

SD-18 Records

Concrete; FIO.

Copies of certified delivery tickets for all concrete used in the construction.

1.3 WEATHER LIMITATIONS

1.3.1 Placing During Cold Weather

Concrete placement shall be discontinued when the air temperature reaches 40 degrees F and is falling. Placement may begin when the air temperature reaches 35 degrees F and is rising. Provisions shall be made to protect the concrete from freezing during the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 35 degrees F, placement shall be approved in writing. Approval shall be contingent upon full conformance with the following provisions. The underlying material shall be prepared and protected so that it is entirely free of frost when the concrete is deposited. Mixing water and aggregates shall be heated as necessary to result in the temperature of the in-place concrete being between 50 and 85 degrees F. Methods and equipment for heating shall be approved. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

1.3.2 Placing During Warm Weather

The temperature of the concrete as placed shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall

be cooled, if necessary, to maintain a satisfactory placing temperature. In no case shall the placing temperature exceed 95 degrees F.

1.4 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.4.1 General Requirements

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times. The equipment shall have the capability of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified. Use of the equipment shall be discontinued if it produces unsatisfactory results. The Contracting Officer shall have access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

1.4.2 Slip Form Equipment

Slip form paver or curb forming machine, will be approved based on trial use on the job and shall be self-propelled, automatically controlled, crawler mounted, and capable of spreading, consolidating, and shaping the plastic concrete to the desired cross section in one pass.

PART 2 PRODUCTS

2.1 CONCRETE

Concrete shall conform to the applicable requirements of Section 03300 CONCRETE FOR BUILDING CONSTRUCTION except as otherwise specified. Concrete shall have a minimum compressive strength of 3500 psi at 28 days. Maximum size of aggregate shall be 1-1/2 inches.

2.1.1 Air Content

Mixtures shall have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

2.1.2 Slump

The concrete slump shall be 3 inches where determined in accordance with ASTM C 143.

2.1.3 Reinforcement Steel

Reinforcement bars shall conform to ASTM A 615, ASTM A 616, or ASTM A 617. Wire mesh reinforcement shall conform to ASTM A 185.

2.2 CONCRETE CURING MATERIALS

2.2.1 Impervious Sheet Materials

Impervious sheet materials shall conform to ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

2.2.2 Burlap

Burlap shall conform to FS CCC-C-467.

2.2.3 White Pigmented Membrane-Forming Curing Compound

White pigmented membrane-forming curing compound shall conform to ASTM C 309, Type 2.

2.3 CONCRETE PROTECTION MATERIALS

Concrete protection materials shall be a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the contractor, commercially prepared linseed oil mixtures, formulated specifically for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

2.4 JOINT FILLER STRIPS

2.4.1 Contraction Joint Filler for Curb and Gutter

Contraction joint filler for curb and gutter shall consist of hard-pressed fiberboard.

2.4.2 Expansion Joint Filler, Premolded

Expansion joint filler, premolded, shall conform to ASTM D 1751 or ASTM D 1752, 3/8 inch thick, unless otherwise indicated.

2.5 JOINT SEALANTS

2.5.1 Joint Sealant, Cold-Applied

Joint sealant, cold-applied shall conform to COE CRD-C 527.

2.5.2 Joint Sealant, Hot-Poured

Joint sealant, hot-poured shall conform to FS SS-S-1401.

2.6 FORM WORK

Form work shall be designed and constructed to insure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete. Wood forms shall be surfaced plank, 2-inch nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet. Radius bends may be formed with 3/4-inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Ends of steel forms shall be interlocking and self-aligning. Steel forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Steel forms shall have a nominal length of 10 feet with a minimum of two welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

2.6.1 Sidewalk Forms

Sidewalk forms shall be of a height equal to the full depth of the finished sidewalk.

2.6.2 Curb and Gutter Forms

Curb and gutter outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter as indicated and shall be securely fastened to and supported by the outside form. Rigid forms shall be provided for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

The subgrade shall be constructed to the specified grade and cross section prior to concrete placement. Subgrade shall be placed and compacted to conform with applicable requirements of Section 02225.

3.1.1 Sidewalk Subgrade

The subgrade shall be tested for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

3.1.2 Curb and Gutter Subgrade

The subgrade shall be tested for grade and cross section by means of a template extending the full width of the curb and gutter. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement.

3.1.3 Maintenance of Subgrade

The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected so as to produce a subgrade free from frost when the concrete is deposited.

3.2 FORM SETTING

Forms shall be carefully set to the indicated alignment, grade and dimensions. Forms shall be held rigidly in place by a minimum of three stakes per form placed at intervals not to exceed 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to insure rigidity in the forms. Forms shall be removed without injuring the concrete. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete found defective after form removal shall be promptly and satisfactorily repaired. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.2.1 Sidewalks

Forms for sidewalks shall be set with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10-foot long section. After forms are set, grade and alignment shall be checked with a 10-foot straightedge. Forms shall have a transverse slope as indicated of 1/4-inch

per foot with the low side adjacent to the roadway. Side forms shall not be removed for 12 hours after finishing has been completed.

3.2.2 Curbs and Gutters

The forms of the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. Forms back of curb shall remain in place until the face and top of the curb have been finished as specified for concrete finishing. Gutter forms shall not be removed while the concrete is sufficiently plastic to slump in any direction.

3.3 SIDEWALK CONCRETE PLACEMENT AND FINISHING

3.3.1 Formed Sidewalks

Concrete shall be placed in the forms in one layer of such thickness that when consolidated and finished the sidewalks will be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted. The concrete shall be consolidated with an approved vibrator, and the surface shall be finished to grade with a wood float, bull float, or darby, edged and broom finished.

3.3.2 Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, the surface shall be finished to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic.

3.3.3 Edge and Joint Finishing

All slab edges, including those at formed joints, shall be finished carefully with an edger having a radius of 1/8 inch. Transverse joint shall be edged before brooming, and the brooming shall eliminate the flat surface left by the surface face of the edger. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

3.3.4 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.4 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

3.4.1 Formed Curb and Gutter

Concrete shall be placed to the section required in a single lift. Consolidation shall be achieved by using approved mechanical vibrators.

3.4.2 Concrete Finishing

Exposed surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes.

The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. The front curb surface, while still wet, shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float.

3.4.3 Joint Finishing

Curb edges at formed joints shall be finished as indicated.

3.4.4 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.5 SIDEWALK JOINTS

Sidewalk joints shall be constructed to divide the surface into rectangular areas. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width or 5 feet on centers, whichever is less, and shall be continuous across the slab. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks 10 feet or more in width. Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated. Expansion joints shall be formed about structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated.

3.5.1 Contraction Joints

The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove, or by sawing a groove in the hardened concrete with a power-driven saw, unless otherwise approved. Sawed joints shall be constructed by sawing a groove in the concrete with a 1/8-inch blade to the depth indicated. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operations.

3.5.2 Expansion Joints

Expansion joints shall be formed with 3/8 inch joint filler strips. Joint filler shall be placed with top edge 1/4 inch below the surface and shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch, and concrete over the joint filler shall be removed. At the end of the curing period, expansion joints shall be carefully cleaned and filled with joint sealer.

The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing shall be done so that the material will not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material. Excess material on exposed

surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

3.5.3 Reinforcement Steel Placement

3.6 CURB AND GUTTER JOINTS

Curb and gutter joints shall be constructed at right angles to the line of curb and gutter.

3.6.1 Contraction Joints

Contraction joints shall be constructed directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length. Contraction joints shall be constructed by means of 1/8-inch thick separators and of a section conforming to the cross section of the curb and gutter. Separators shall be removed as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.

3.6.2 Expansion Joints

Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement, and shall be of the same type and thickness as joints in the pavement. Where curb and gutter do not abut portland cement concrete pavement, expansion joints at least 3/8 inch in width shall be provided at intervals not exceeding 60 feet. Expansion joints shall be provided in nonreinforced concrete gutter at locations indicated. Expansion joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit.

Expansion joints and the top 1-inch depth of curb and gutter contraction-joints shall be sealed with joint sealer. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing shall be done so that the material will not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

3.7 CURING AND PROTECTION

3.7.1 General Requirements

Concrete shall be protected against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

3.7.1.1 Mat Method

The entire exposed surface shall be covered with two or more layers of burlap. Mats shall overlap each other at least 6 inches. The mat shall be thoroughly wetted with water prior to placing on concrete surface and shall be

kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

3.7.1.2 Impervious Sheeting Method

The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 12 inches when a continuous sheet is not used. The curing medium shall not be less than 18-inches wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or a bank of moist earth placed along edges and laps in the sheets. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

3.7.1.3 Membrane Curing Method

A uniform coating of white-pigmented membrane-curing compound shall be applied to the entire exposed surface of the concrete as soon after finishing as the free water has disappeared from the finished surface. Formed surfaces shall be coated immediately after the forms are removed and in no case longer than 1 hour after the removal of forms. Concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water and the curing compound applied as soon as the free water disappears. Curing compound shall be applied in two coats by hand-operated pressure sprayers at a coverage of approximately 200 square feet per gallon for both coats. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. If pinholes, abrasion, or other discontinuities exist, an additional coat shall be applied to the affected areas within 30 minutes. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be resprayed. Necessary precautions shall be taken to insure that the concrete is properly cured at sawed joints, and that no curing compound enters the joints. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed before the concrete in the region of the joint is resprayed with curing compound. The method used for sealing the joint groove shall prevent loss of moisture from the joint during the entire specified curing period. Approved standby facilities for curing concrete pavement shall be provided at a location accessible to the jobsite for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from any other possible damage to the continuity of the membrane.

3.7.2 Backfilling

After curing, debris shall be removed and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.

3.7.3 Protection

Completed concrete shall be protected from damage until accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Concrete that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed.

3.8 FIELD QUALITY CONTROL

3.8.1 General Requirements

The Contractor shall perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing. Based upon the results of these inspections and tests, the Contractor shall take the action and submit reports as required below, and any additional tests to insure that the requirements of these specifications are met.

3.8.2 Concrete Testing

3.8.2.1 Strength Testing

The Contractor shall provide molded concrete specimens for strength tests. Samples of concrete placed each day shall be taken not less than once a day nor less than once for every 250 cubic yards of concrete. The samples for strength tests shall be taken in accordance with ASTM C 172. Cylinders for acceptance shall be molded in conformance with ASTM C 31 by an approved testing laboratory. Each strength test result shall be the average of two test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

3.8.2.2 Air Content

Air content shall be determined in accordance with ASTM C 173 or ASTM C 231. ASTM C 231 shall be used with concretes and mortars made with relatively dense natural aggregates. Two tests for air content shall be made on randomly selected batches of each class of concrete placed during each shift. Additional tests shall be made when excessive variation in concrete workability is reported by the placing foreman or the Government inspector. If results are out of tolerance, the placing foreman shall be notified and he shall take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.

3.8.2.3 Slump Test

Two slump tests shall be made on randomly selected batches of each class of concrete for every 250 cubic yards, or fraction thereof, of concrete placed during each shift. Additional tests will be performed when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noticed along the edges of slip-formed concrete.

3.8.3 Thickness Evaluation

The anticipated thickness of the concrete shall be determined prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine.

If a slip form paver is used for sidewalk placement, the subgrade shall be true to grade prior to concrete placement and the thickness will be determined by measuring each edge of the completed slab.

3.8.4 Surface Evaluation

The finished surface of each category of the completed work shall be uniform in color and free of blemishes and form or tool marks.

3.9 SURFACE DEFICIENCIES AND CORRECTIONS

3.9.1 Thickness Deficiency

When measurements indicate that the completed concrete section is deficient in thickness by more than 1/4 inch the deficient section will be removed, between regularly scheduled joints, and replaced.

3.9.2 High Areas

In areas not meeting surface smoothness and plan grade requirements, high areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and the depth of grinding shall not exceed 1/4 inch. All pavement areas requiring grade or surface smoothness corrections in excess of the limits specified above shall be removed and replaced.

3.9.3 Appearance

Exposed surfaces of the finished work will be inspected by the Government and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced.

END OF SECTION 02511

SECTION C-02513

BITUMINOUS PAVEMENT

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T-27	(1984) Sieve Analysis of Fine and Coarse Aggregate
AASHTO T-30	(1984) Mechanical Analysis of Extracted Aggregate
AASHTO T-140	(1986)R Sampling Bituminous Materials
AASHTO T-164	(1986) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 127	(1984) Specific Gravity and Absorption of Coarse Aggregate
ASTM C 128	(1984) Specific Gravity and Absorption of Fine Aggregate

COMMONWEALTH OF MASSACHUSETTS, MASSACHUSETTS HIGHWAY DEPARTMENT

The Commonwealth of Massachusetts, Massachusetts Highway Department Standard Specification for Highways and Bridges, 1988.

1.3 GENERAL

All work and materials shall conform to the applicable requirements of the Massachusetts Highway Department Standard Specifications except as noted in these specifications, construction plans or contract documents. In case of difference between Massachusetts Highway Dept. Specifications and the CONTRACT CLAUSES and SPECIAL CONTRACT REQUIREMENTS of this Solicitation, the CONTRACT CLAUSES and SPECIAL CONTRACT REQUIREMENTS shall govern.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittal shaving an "FIO" designation are for information only. The following shall be submitted in accordance with Section C-01300 SUBMITTALS:

SD-01 Data

Job Mix Formula (JMF); GA. Aggregates; GA. Bituminous Material; GA.

The job mix formula, at least 14 days before it is to be used. Notification on the selection of aggregate source Notification on the selection of bituminous materials source.

SD-09 Reports

Test; FIO.

Certified copies of aggregate test results, not less than 30 days before the material is required in the work.

SD-13 Certificates

Bituminous Material; FIO.

Certified copies of the bituminous material manufacturer's test reports indicating compliance with applicable specified requirements, not less than 30 days before the material is required in the work.

1.5 ABBREVIATIONS AND DEFINITIONS

Where such terms as "Director," “Engineer” or "Department" are used, they shall mean "Contracting Officer." Whenever the words "Extra Work" or similar phrase is used, it shall mean "Changes" as defined in the CONTRACT CLAUSES.

1.6 MEASUREMENT AND PAYMENT

Measurement and payment will be made part of the Lump Sum Payment for the project.

PART 2 - PRODUCTS

2.1 JOB MIX FORMULA

The Contractor shall submit to the Contracting Officer for approval five copies of the bituminous job-mix formulas. The job-mix formulas shall be based on Section 400 of the Massachusetts Highway Dept. specifications for Bituminous Pavements.

PART 3 - EXECUTION

3.1 QUALITY CONTROL

3.1.1 LABORATORY

The Contractor shall procure the services of an industry recognized laboratory to perform the testing specified.

3.2 USE BY GOVERNMENT OF CONTRACTOR-FURNISHED FIELD LABORATORY

The Contracting Officer reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance test and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.3 TESTING PROGRAM

The location of each test chosen shall be selected to provide adequate representation of the material being placed and to obtain the maximum coverage of each lift or layer placed. The listing of these tests does not relieve the Contractor of the responsibility for performing the tests designated in other sections of these specifications. The Contracting Officer may select the time and location for any testing required under this contract.
Standards indicated in parentheses are alternate testing standards essentially equal to the first method indicated. The Contractor shall identify which standard was used when submitting test results.

Fine Aggregate		
Grain Size Analysis	AASHTO T-27	Cold feed, 1 test per 3 shifts (Hot bin, 1 test per shift
Oven Dry Bulk	ASTM C-128	1 Test Specific Gravity
Coarse Aggregate		
Grain Size Analysis	AASHTO T-27	Cold feed, 1 test per 3 shifts (Hot bin, 1 test per shift)
Oven Dry Bulk	ASTM C-127	1 test Specific Gravity
Bituminous Mixtures		
Extraction of Bitumen	Sampling AASHTO T-168 Extraction AASHTO T-164	1 test per shift

Mechanical Analysis	AASHTO T-30	1 test per shift of Extracted Aggregate
Pavement Sample-for Thickness	Cut Full Depth from Compacted Pavement and Replace with new Material	1 per 10,000 SF Thickness

3.4 MAINTENANCE OF WORK

Maintenance of work shall be in accordance with Section 619 of the Massachusetts Highway Dept. Standard Specifications

END OF SECTION 02513

SECTION 02660

WATER LINES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300	(1992) Hypochlorites
AWWA B301	(1992) Liquid Chlorine
AWWA C104	(1990) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110	(1987) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
AWWA C111	(1990) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C151	(1991) Ductile-Iron Pipe, Centrifugally Cast for Water or Other Liquids
AWWA C153	(1988) Ductile-Iron Compact Fittings, 3 In. Through 16 In., for Water and Other Liquids
AWWA C203	(1991) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA C205	(1989) Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. and Larger - Shop Applied
AWWA C500	(1986) Gate Valves for Water and Sewerage Systems
AWWA C502	(1985) Dry-Barrel Fire Hydrants
AWWA C509	(1987) Resilient-Seated Gate Valves for Water and Sewerage Systems
AWWA C600	(1987) Installation of Ductile-Iron Water Mains and Their Appurtenances

AWWA C606	(1987) Grooved and Shouldered Joints
AWWA C651	(1986; C651a) Disinfecting Water Mains
AWWA C702	(1992) Cold-Water Meters - Compound Type
AWWA C707	(1982; R 1992) Encoder-Type Remote-Registration Systems for Cold-Water Meters

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTING INDUSTRY (MSS)

MSS SP-80	(1987) Bronze Gate, Globe, Angle and Check Valves

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 24	(1987) Installation of Private Fire Service Mains and Their Appurtenances

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 21	(1991) White or Colored Silicone Alkyd Paint
SSPC Paint 25	(1991) Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (without Lead and Chromate Pigments)

1.2 PIPING

This section covers water service lines and connections to which service is required. The Contractor shall have a copy of the manufacturer's recommendations for each material or procedure to be utilized available at the construction site at all times. Cathodic Protection shall be provided on all underground utilities as indicated or shown in specification Section 16642.

1.2.1 Service Lines

Piping for water service lines shall be ductile iron, unless otherwise shown or specified.

1.2.2 Sprinkler Supply Lines

Piping for water lines supplying cooling systems for airframe fire protection shall conform to NFPA 24 from the point of connection with the water distribution system.

1.2.3 Excavation, Trenching, and Backfilling

Excavation, trenching, and backfilling shall be in accordance with the applicable provisions of Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, except as modified herein.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The

following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings

Burn Pit Water Piping; GA
Detail piping layout drawings for water piping to the airframe with the plane shown in the proper orientation.

SD-06 Instructions

Installation; FIO

The manufacturer's recommendations for each material or procedure to be utilized.

SD-08 Statements

Statement of Satisfactory Installation; GA

A statement signed by the principal officer of the contracting firm stating that the installation is satisfactory and in accordance with the contract plans and specifications and the manufacturer's prescribed procedures and techniques, upon completion of the project and before final acceptance.

SD-09 Reports

Bacterial Examination; GA

Test results from commercial laboratory verifying disinfection.

1.4 HANDLING

Pipe and accessories shall be handled so as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. No other pipe or material of any kind shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

PART 2 PRODUCTS

2.1 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Ductile-Iron Pipe

The pipe to be used from the water main to the valve pit shall be ductile-iron, unless otherwise shown on the Drawings. All pipe furnished shall be

accompanied by the manufacturer's Certificate of Compliance, in addition to meeting the performance tests hereinafter specified. Ductile-iron pipe shall conform to AWWA C150 and AWWA C151. Ductile-iron pipe shall be Pressure Class 350 unless otherwise specified. Ductile-iron pipe shall conform to the following:

Size (Inches)	Thickness (Inches)	Pressure Class (PSI)	Outside Diameter (Inches)
8	0.25	350	9.05
6	0.25	350	6.90

Pipe shall have normal laying lengths of at least 18 feet. Ductile-iron pipe and fittings shall be double thick cement lined in accordance with AWWA C104. The thickness of cement lining shall be not less than 1/8 inch for 3-inch to 12-inch pipe. All ductile-iron pipe (interior and Exterior) shall have a seal coat of asphaltic material in conformance with AWWA C104.

2.2.1 Ductile-Iron Fittings

Fittings shall conform to AWWA C153 with pressure rating of 350 psi. Fittings shall have mechanical joints. Mechanical joints shall be furnishes with suitable appliances for insuring electrical conductivity, in accordance with the recommendations of the manufacturer. Fittings shall be cement-mortar lined (double thickness) in accordance with AWWA C104.

2.3.1. Ductile-Iron Joints

a. Push-on joints for ductile-iron pipe shall be rubber gasket joints conforming to AWWA C111. Serrated silicon bronze wedges shall be inserted at the horizontal diameter of each push-on joint as recommended by the manufacturer.

b. Rubber gaskets and lubricants shall conform to the applicable requirements of AWWA C111.

2.4 VALVES

2.4.1 Gate Valves

Gate valves shall be designed for a working pressure of not less than 150 psi. Valve connections shall be as required for the piping in which they are installed. Valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counterclockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.

a. Valves smaller than 3 inches shall be all bronze and shall conform to MSS SP-80, Type 1, Class 150.

b. Valves 3 inches and larger shall be iron body, bronze mounted, and shall conform to AWWA C500. Flanges shall not be buried. An approved pit shall be provided for all flanged connections.

c. Resilient-Seated Gate Valves: For valves 3 inches to 12 inches in size, resilient-seated gate valves shall conform to AWWA C509.

2.4.2 INDICATOR POST FOR VALVES

Each valve shown on the drawings with the designation "PIV" shall be equipped with indicator post conforming to the requirements of NFPA 24. Operation shall be by a wrench, which will be attached to each post.

2.5 VALVE BOXES

Valve boxes shall be cast iron or concrete, except that concrete boxes may be installed only in locations not subjected to vehicular traffic. Cast-iron boxes shall be extension type with slide-type adjustment and with flared base. The minimum thickness of metal shall be 5/16 inch. Concrete boxes shall be the standard product of a manufacturer of precast concrete equipment. The word "WATER" shall be cast in the cover. The box length shall adapt, without full extension, to the depth of cover required over the pipe at the valve location.

2.6 VALVE PITS

Valve pits shall be constructed at locations indicated or as required above and in accordance with the details shown. Concrete shall have compressive strength of 3000 psi in accordance with Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

2.7 FIRE HYDRANTS

Hydrants shall conform to AWWA C502. Hydrant shall be dry-barrel type conforming to AWWA C502. Hydrant shall be break-off flange type; hydrant shall open by turning counterclockwise. Hydrants shall have a 6-inch bell connection, two 1-1/2 inch hose connections and one pumper connection. Outlets shall have American National Standard fire-hose coupling threads. Working parts shall be bronze. Design, material, and workmanship shall be similar and equal to the latest stock pattern ordinarily produced by the manufacturer. Hydrants shall be painted with one coat of red iron oxide, zinc oxide primer conforming to SSPC Paint 25 and two finish coats of silicone alkyd paint conforming to SSPC Paint 21, of the color directed. Hydrants shall conform to all base standards (Mueller Super Centurion 200, O.A.E.), including all repair and replacement kits and components.

2.8 MISCELLANEOUS ITEMS

2.8.1 Service Clamps

Service clamps shall have a pressure rating not less than that of the pipe to be connected and shall be either the single or double flattened strap type. Clamps shall have a galvanized malleable-iron body with cadmium-plated straps and nuts. Clamps shall have a rubber gasket cemented to the body.

2.8.2 Corporation Stops

Corporation stops shall have standard corporation stop thread conforming to AWWA C800 on the inlet end, with flanged joints, compression pattern flared tube couplings, or wiped joints for connections to goosenecks.

2.8.3 Service Stops

Service stops shall be water-works inverted-ground-key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of service pipe used. All parts shall be of bronze with female iron-pipe-size connections or compression-pattern flared tube couplings, and shall be designed for a hydrostatic test pressure not less than 200 psi.

2.8.4 Tapping Sleeves

Tapping sleeves of the sizes indicated for connection to existing main shall be the cast gray, ductile, or malleable-iron, split-sleeve type with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 150 psi. Bolts shall have square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 4.6 lbf/ft.

2.8.5 Service Boxes

Service boxes shall be cast iron or concrete and shall be extension service boxes of the length required for the depth of the line, with either screw or slide-type adjustment. The boxes shall have housings of sufficient size to completely cover the service stop or valve and shall be complete with identifying covers.

2.8.6 Disinfection

Chlorinating materials shall conform to the following:

Chlorine, Liquid: AWWA B301.

Hypochlorite, Calcium and Sodium: AWWA B300.

2.8.7 Exposed, Freestanding Fire Department Connection

Exposed, freestanding, fire department connections, UL 405, cast brass body, inlet with threads according to NFPA 1963 and matching local fire department sizes and threads and bottom outlet with pipe threads. Include brass lugged caps, gaskets and brass chains. Brass , lugged swivel connection and drop clapper for 2-way hose connection inlet, 36-inch high brass sleeve and round brass escutcheon plate with marking "dry standpipe", finish will be polished brass.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Cutting of Pipe

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practicable. Squeeze type mechanical cutters shall not be used for ductile iron.

3.1.2 Adjacent Facilities

3.1.2.1 Sewer Lines

Where the location of the water pipe is not clearly defined in dimensions on the drawings, the water pipe shall not be laid closer horizontally than 10 feet from a sewer except where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, in which case the water pipe shall not be laid closer horizontally than 6 feet from the sewer. Where water lines cross under gravity-flow sewer lines, the sewer pipe for a distance of at least 10 feet each side of the crossing shall be fully encased in concrete or shall be made of pressure pipe with no joint located within 36 inches horizontally of the crossing. Water lines shall in all cases cross above sewage force mains or inverted siphons and shall be not less than 24 inches above the sewer main. Joints in the sewer main, closer horizontally than 36 inches to the crossing, shall be encased in concrete.

3.1.2.2 Water Lines

Water lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.

3.1.3 Joint Deflection

3.1.3.1 Ductile-Iron Pipe

The maximum allowable deflection shall be as given in AWWA C600. If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

3.1.4 Placing and Laying

Pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other authorized equipment. Under no circumstances shall any of the water-line materials be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe coating. Except where necessary in making connections with other lines or as authorized by the Contracting Officer, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, couplings, and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until joints are complete. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored, as shown.

3.1.4.1 Connections

Where connections are made between new work and existing mains, the connections shall be made by using specials and fittings to suit the actual conditions.

3.1.4.2 Penetrations

Pipe passing through walls of valve pits and structures shall be provided with ductile-iron or Schedule 40 steel wall sleeves. Annular space between walls and sleeves shall be filled with rich cement mortar. Annular space between pipe and sleeves shall be filled with mastic.

3.1.5 Jointing

3.1.5.1 Ductile-Iron Pipe

Mechanical and push-on type joints shall be installed in accordance with AWWA C600 for buried lines or AWWA C606 for grooved and shouldered pipe above ground or in pits.

3.1.5.2 Dielectric Fittings

Dielectric fittings shall be installed in the pipe riser, 1'-0" above finish grade or at the first joint above finish grade where underground piping transitions to above ground piping. Dielectric unions shall be encapsulated in a field-poured coal-tar covering, with at least 12 mils of coal tar over all fitting surfaces.

3.1.5.3 Connections

Connections between different types of pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

3.1.6 Service Lines

Service lines shall include the pipeline connecting building piping to water distribution lines to the connections with the building service at a point approximately 5 feet outside the building where such building service exists. Where building services are not installed, the Contractor shall terminate the service lines approximately 5 feet from the site of the proposed building at a point designated by the Contracting Officer. Such service lines shall be closed with plugs or caps. All service stops and valves shall be provided with service boxes. Service lines shall be constructed in accordance with the following requirements:

3.1.6.1 Service Lines for Cooling Supplies

Water service lines used to supply cooling system for airframe fire protection shall be connected to the water distribution main in accordance with NFPA 24.

3.1.7 Field Coating and Lining of Pipe

3.1.7.1 Ductile Iron Pipe 3 inches and Larger

a. Cement-mortar coating and lining: Field jointing shall conform to Appendix, AWWA C205. Any defective area found in the coating and/or lining of pipe and joints shall be removed to the pipe wall and repaired. The repaired areas shall be at least equal in thickness to the minimum coating and/or lining required for the pipe. Steel reinforcement in the coating shall be repaired or replaced as necessary to assure a complete and soundly reinforced coating.

b. Coal-tar enamel coating, lining and wrapping: Field jointing shall conform to AWWA C203. The applied materials shall be tested by means of a spark-type electrical inspection device in accordance with the requirements of AWWA C203. Any flaws or holidays found in the coating and/or lining of pipe and joints shall be repaired by patching or other approved means. The repaired areas shall be at least equal in thickness to the minimum coating and/or lining required for the pipe.

3.1.8 Setting of Fire Hydrants, Valves and Valve Boxes

3.1.8.1 Fire Hydrants

Fire hydrants shall be located and installed as shown. Each hydrant shall be connected to the main with a 6 inch branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with pumper nozzle facing the roadway, with the center of the lowest outlet not less than 18 inches above the finished surrounding grade, and the operating nut not more than 4 feet above the finished surrounding grade. Fire hydrants designated on the drawings as low profile shall have the lowest outlet not less than 18 inches above the finished surrounding grade, the top of the hydrant not more than 24 inches above the finished surrounding grade. Except where approved otherwise, the backfill around hydrants shall be thoroughly compacted to the finished gradeline immediately after installation to obtain beneficial use of the hydrant as soon as practicable. The hydrant shall be set upon a slab of concrete not less than 4 inches thick and 16 inches square. Not less than 2-1/2 cubic yards of free-draining broken stone or gravel shall be placed around and beneath the waste opening of dry barrel hydrants to ensure drainage.

3.1.8.2 Valves

After delivery, valves, including those in hydrants, shall be drained to prevent freezing and shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and hydrants and valves shall be fully opened and fully closed to ensure that all parts are in working condition. Check, pressure reducing, vacuum, and air relief valves shall be installed in valve pits. Valves and valve boxes shall be installed where shown or specified, and shall be set plumb. Valve boxes shall be centered on the valves. Boxes shall be installed over each outside gate valve unless otherwise shown. Where feasible, valves shall be located outside the area of roads and streets. Earth fill shall be carefully tamped around each valve box or pit to a distance of 4 feet on all sides of the box, or the undisturbed trench face if less than 4 feet.

3.1.8.3 Service Boxes

Where water lines are located below paved streets having curbs, the boxes shall be installed directly back of the curbs. Where no curbing exists, service boxes shall be installed in accessible locations, beyond the limits of street surfacing, walks and driveways.

3.1.9 Tapped Tees and Crosses

Tapped tees and crosses for future connections shall be installed where shown.

3.1.10 Thrust Restraint

Plugs, caps, tees and bends deflecting 11-1/4 degrees or more, either vertically or horizontally, on waterlines 4 inches in diameter or larger, and fire hydrants shall be provided with thrust restraints. Valves shall be securely anchored or shall be provided with thrust restraints to prevent movement. Thrust restraints shall be either thrust blocks or, for ductile-iron pipes, restrained joints.

3.1.10.1 Thrust Blocks

Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 3000 psi

after 28 days. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting joints will be accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

3.2 HYDROSTATIC TESTS

Where any section of a water line is provided with concrete thrust blocking for fitting or hydrants, the hydrostatic tests shall not be made until at least 5 days after installation of the concrete thrust blocking, unless otherwise approved.

3.2.1 Pressure Test

After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 200 psi. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves, discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Contracting Officer when one or more of the following conditions is encountered:

a. Wet or unstable soil conditions in the trench.

b. Compliance would require maintaining barricades and walkways around and across an open trench in a heavily used area that would require continuous surveillance to assure safe conditions.

c. Maintaining the trench in an open condition would delay completion of the contract.

The Contractor may request a waiver, setting forth in writing the reasons for the request and stating the alternative procedure proposed to comply with the required hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.2.2 Leakage Test

Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to not less than 200 psi pressure. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section thereof, necessary to maintain pressure within 5 psi of the specified leakage test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted if leakage exceeds the allowable leakage which is determined by the following formula:

$$L = 0.0001351ND(P \text{ raised to } 1/2 \text{ power})$$

L = Allowable leakage in gallons per hour
N = Number of joints in the length of pipeline tested
D = Nominal diameter of the pipe in inches
P = Average test pressure during the leakage test, in psi gauge

Should any test of pipe disclose leakage greater than that calculated by the above formula, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the Government.

3.2.3 Time for Making Test

Except for joint material setting or where concrete thrust blocks necessitate a 5-day delay, pipelines jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. Cement-mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

3.2.4 Concurrent Hydrostatic Tests

The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be satisfactory as specified. All replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

a. Pressure test and leakage test may be conducted concurrently.

b. Hydrostatic tests and disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be reaccomplished.

3.3 DISINFECTION

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as prescribed by AWWA C651. After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall be either liquid chlorine, calcium hypochlorite, or sodium hypochlorite, conforming to paragraph MISCELLANEOUS ITEMS. The chlorinating material shall provide a dosage of not less than 50 ppm and shall be introduced into the water lines in an approved manner. In no case will the agent be introduced into the line in a dry solid state. The treated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 25 ppm of free chlorine residual throughout the line at the end of the retention period. All valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. During the flushing period, each fire hydrant on the line shall be opened and closed several times. From several points in the unit, the Contracting Officer will take samples of water

in proper sterilized containers for bacterial examination or personnel from the Contractor's commercial laboratory shall take at least 3 water samples from different points, approved by the Contracting Officer, in proper sterilized containers and perform a bacterial examination in accordance with state approved methods. The commercial laboratory must be certified by the state's approving authority for examination of potable water. The disinfection shall be repeated until tests indicate the absence of pollution for at least 2 full days. The unit will not be accepted until satisfactory bacteriological results have been obtained.

3.4 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

END OF SECTION 02660

SECTION 02699

VALVE MANHOLES AND PIPING AND EQUIPMENT IN VALVE MANHOLES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designations only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI H35.1	(1993) Alloy and Temper Designation Systems for Aluminum

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A53	(1990b) Pipe, Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless
ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.34	(1988) Valves - Flanged, Threaded, and Welding End
ASME B31.1	(1992; B31.1a; B31.1b) Power Piping
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element

FEDERAL SPECIFICATIONS (FS)

FS RR-F-621	(Rev E) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole
FS WW-V-35	(Rev C) Valve, Ball

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-25	(1993) Standard Marking System for Valves, Fittings, Flanges, and Unions
MSS SP-58	(1993) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(1991) Pipe Hangers and Supports - Selection and Application
MSS SP-80	(1987) Bronze Gate, Globe, Angle and Check Valves
MSS SP-83	(1987) Steel Pipe Unions Socket-Welding and Threaded

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1993) National Electrical Code

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 16	(1991) Coal-Tar Epoxy-Polyamide Black (or Dark Red) Paint
SSPC SP 10	(1991) Near-White Blast Cleaning

1.2 DESCRIPTION

This specification covers valve manholes and the valves and equipment shown in the manholes on the drawings.

1.3 SUBMITTALS

Government approval is required for submittals having a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01305 SUBMITTAL PROCEDURES:

SD-04 Drawings

Valve Manholes, Pipe, and Equipment FI0.

Detail drawings for valve manholes and the piping and equipment in the valve manholes, such as steam traps, valves, sump pumps, pressure gauges, thermometers and insulation, including a complete list of equipment and materials, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Drawings shall also contain complete wiring and schematic diagrams. Drawings shall show pipe anchors and guides, and layout and anchorage of equipment and appurtenances in valve manholes, and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-19 Operation and Maintenance Manuals

Valve Manholes, Pipe, and Equipment FI0.

Six copies of operation and six copies of maintenance manuals are required for the equipment furnished. Operation manuals shall detail the step-by-step procedures required for equipment startup, operation, and shutdown. Operation manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include piping and equipment layout and simplified wiring and control diagrams indicating location of electrical components with terminals designated for wiring, as installed.

1.4 DELIVERY AND STORAGE

All materials and equipment delivered and placed in storage shall be stored with protection from the weather, excessive humidity and excessive temperature variation; and dirt, dust, or other contaminants.

1.5 FIELD MEASUREMENTS

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

2.2 NAMEPLATES

Each major item of equipment such as sump pumps, motors, steam traps, and pressure reducing valves shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

2.3 ASBESTOS PROHIBITION

Asbestos and asbestos-containing products shall not be used.

2.4 ELECTRICAL WORK

Motors, manual or automatic motor control equipment, and protective or signal devices required for the operation specified shall be provided under this section in accordance with NFPA 70 and Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND, and Section 16415 ELECTRICAL WORK, INTERIOR.

2.5 PIPING AND FITTINGS

2.5.1 General

Piping, fittings and piping accessories inside the valve manholes shall conform to the requirements of ASME B31.1 and shall be suitable for the working pressure and temperature requirements of the system. To the greatest extent possible, the piping and fittings inside the valve manholes shall match the piping and fittings located on the outside of the valve manhole. All piping in valve manholes shall be steel with joints welded except that joints 3/4 inch and smaller may be threaded. When threaded joints are used on High Temperature Water Systems, the interface area where the pipe threads meet the threaded fittings shall be seal welded (continuous fillet weld) to preclude any water leakage. No supports, anchors, or stays shall be attached to any piping system in places where either the installation of or the movement of the pipe and its contents will cause damage to the construction.

2.5.2 Fittings

All fittings, valves, flanges and unions shall have the manufacturer's trademark affixed in accordance with MSS SP-25 so as to permanently identify the manufacturer.

2.5.2.1 Unions

Unions shall conform to MSS SP-83, standard weight or extra heavy, as

required to match adjacent piping.

2.5.2.2 Ball Valves

Ball valves shall conform to FS WW-V-35, ductile iron or bronze, threaded, welded, or flanged ends.

2.6 VALVES

Unless otherwise specified, valves shall comply with the material, fabrication, and operating requirements of ASME B31.1. Valves shall be suitable for the temperature and pressure requirements of the system on which used.

2.6.1 Steel Valves

Steel globe, gate, angle, and check valves shall conform to the requirements of ASME B16.34 and ASME B31.1 for the temperature and pressure requirements of the system. Gate valves 2-1/2 inches and smaller shall be rising stem. Gate valves 3 inches and larger shall be outside screw and yoke.

2.6.2 Bronze Valves

2.6.2.1 Globe, Gate, and Angle Valves

Bronze globe, gate, and angle valves shall conform to requirements of MSS SP-80, union bonnet type.

2.6.2.2 Check Valves

Bronze check valves shall conform to the requirements of MSS SP-80

2.6.3 Packing

Packing used with valves shall not contain asbestos. Valve stem packing shall be die-formed, ring type specifically designated as suitable for the temperature and pressure of the service and compatible with the fluid in the system. Packing shall be polytetrafluoroethylene with minimum 50 percent graphite filament. Valves 1-1/2 inches and smaller shall have four or five packing rings and valves 2 inches and larger shall have at least six packing rings. Spiral or continuous packing will not be acceptable. A metal insert shall be provided having proper clearance around the valve stem at the bottom of the stuffing box and acting as a base for the packing material. Packing glands shall be furnished with a liner of noncorrosive material and shall be of one piece construction with provisions for not less than two bolts for packing adjustment.

2.7 CONCRETE VALVE MANHOLES AND ACCESSORIES

2.7.1 Valve Manhole Construction

Valve manhole dimensions shall be as indicated. The valve manholes shall be constructed of reinforced concrete as indicated and in accordance with Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Cast iron frames and covers shall conform to the requirements of FS RR-F-621 and shall be the type, style and weight indicated. Valve manholes shall be drained as shown. Concrete sections shall not be less than 6 inches thick. The top shall be a cast concrete slab of the same strength and thickness as the valve manhole or fabricated from stainless steel, hot dipped galvanized steel or aluminum. The

top shall be solid plate cover 5/16 inch thick checker pattern conforming to ANSI H35.1. All steel components shall be protected from corrosion.

2.7.2 Ladders

Valve manhole ladders shall be steel, shall have nonslip surfaces, and shall consist of uprights with steps or rungs. Ladders shall not be less than 16 inches in width, with 3/4 inch diameter rungs, spaced 12 inches apart. The two stringers shall be a minimum 3/8 inch thick and 2-1/2 inches wide. Ladders shall be adequately anchored to the wall by means of steel inserts spaced not more than 6 feet apart vertically, and installed to provide at least 6 inches of space between the wall and rungs. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A 123.

2.7.3 Pipe Sleeves

Pipe sleeves of sufficient length to pass through valve manhole or building walls shall be provided. Pipe sleeves shall be zinc-coated steel pipe conforming to the requirement of ASTM A 53, Schedule 40 or standard weight. The pipe sleeves shall be secured in the proper position and location during construction of the valve manhole or building wall. For manhole top penetrations, the diameter of the pipe sleeve will be large enough to allow at least 1/4 inch of clearance between the pipe insulation and the sleeve, and, the sleeve will be sized to accommodate the specific mechanical seal size used for the uninsulated chilled water pipe penetration. The space between the sleeve and the pipe casing, and the caulking and sealing materials shall be selected so that there shall be NO electrical continuity between the pipe sleeve and the pipe casing when finished.

2.7.3.1 Pipe Sleeves for Conduit Penetrations

A modular mechanical type sealing assembly will be used between the valve manhole pipe sleeve and the conduit casing water pipe. The mechanical seal shall consist of interlocking elastomeric links shaped to continuously fill the annular space between the casing and sleeve. The link material shall be a synthetic elastomeric capable of withstanding long term exposure at 400 degrees F without deterioration. The links shall be attached to each other with corrosion resistant steel bolts, nuts and pressure plates. The link, bolts, nuts and pressure plates shall be the product of single manufacturer and shall be furnished as the product of single manufacturer and shall be furnished as a package or kit. The links shall be loosely assembled with bolts to form a continuous rubber belt around the casing with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the casing and the sleeve. The pipe sleeve diameter shall be sized so that no more than one half of the seal assembly's expansion capability is used to achieve a water seal.

2.7.4 Pipe Supports

Pipe Supports shall be in accordance with MSS SP-58 and MSS SP-69, type as shown. All pipe supports, including structural cross support members, shall be galvanized in accordance with Section 05500 MISCELLANEOUS METAL. Chains, straps, or single point supports shall not be used.

2.8 MISCELLANEOUS METAL

Miscellaneous metal not otherwise specified shall conform to Section 05500 MISCELLANEOUS METAL. Miscellaneous metal bolted together, shop welded, or

assembled in the field, and pipe supports including structural cross support members and anchors shall be hot-dip galvanized in accordance with Section 05500 MISCELLANEOUS METAL.

PART 3 EXECUTION

3.1 SITE WORK

3.1.1 Excavation, Trenching, and Backfilling

Excavation, trenching, and backfilling of the valve manholes shall be as shown and in accordance with Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.1.2 Electric Work

Any wiring required for the operation of the equipment specified, but not shown on the electrical drawings, shall be provided under this section in accordance with Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

3.1.3 Painting

The heat affected zone of field welded galvanized surfaces and other galvanized surfaces damaged during installation shall be cleaned in compliance with SSPC SP 10 and painted in accordance with Section 09900 PAINTING, GENERAL. Steel and iron appurtenances, piping, and supports shall be cleaned in compliance with SSPC SP 10 and painted with SSPC Paint 16, coal-tar epoxy-polyamide.

3.2 PIPING

3.2.1 Flanged Joints

Flanged joints shall be faced true, provided with gaskets, and made perfectly square and tight. Flanged joints will be used only for electrical isolation and in other special cases where connected equipment is available with only flanged joints, or, when specifically shown on the drawings. Electrically isolated flange joints shall be provided at all connections to or from the heat distribution system and between dissimilar metals.

3.2.2 Branch Connections

Branches from mains shall branch off top of mains as indicated or as approved. Connections shall insure unrestricted circulation, elimination of air pockets, and shall permit the complete drainage of the system. Branch connections may be made with either welding tees or forged branch outlet fittings. Branch outlet fittings where used shall be forged and shall be no larger than two nominal pipe sizes smaller than the main run. Branch outlet fittings shall be reinforced to withstand external strains and designed to withstand full pipe bursting strength.

3.2.3 Pipe Supports in Valve Manholes

Horizontal and vertical runs of pipe in valve manholes shall be securely supported.

3.3 VALVE MANHOLES AND ACCESSORIES

3.3.1 Piping and Equipment in Valve Manholes

Piping and equipment in valve manholes shall be installed so as to provide easy access without stepping on piping or equipment, and to provide sufficient working room. Piping and equipment in valve manholes shall be installed and supported as shown on the drawings. All globe, angle and gate valves shall be installed with the stems horizontal or above.

3.4 TESTS

Tests of piping in the valve manholes will be performed as part of the testing of the direct buried conduit system. These tests shall include the piping in the valve manhole and shall be in accordance with the system supplier's Approved Brochure or the contract specifications.

End of Section of 02699

SECTION 02710

SUBDRAINAGE SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 252	(1990) Corrugated Polyethylene Drainage Tubing

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3212	(1992) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 5034	(1990) Breaking Force and Elongation of Textile Fabrics (Grab Test)
ASTM F 405	(1993) Corrugated Polyethylene (PE) Tubing and Fittings
ASTM F 667	(1985) Large Diameter Corrugated Polyethylene Tubing and Fittings

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-13 Certificates

Filter Fabric; FIO. Pipe for Subdrains; FIO.

Certifications from the manufacturers attesting that materials meet specification requirements. Certificates are required for drain pipe, drain tile, fittings, and filter fabric.

1.3 DELIVER, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with minimum handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. During shipment and storage, filter fabric shall be wrapped in burlap or similar heavy duty protective covering. The storage area shall

protect the fabric from mud, soil, dust, and debris. Filter fabric materials that are not to be installed immediately shall not be stored in direct sunlight. Plastic pipe shall be installed within 6 months from the date of manufacture unless otherwise approved.

1.3.2 Handling

Materials shall be handled in such a manner as to insure delivery to the trench in sound undamaged condition. Pipe shall be carried and not dragged to the trench.

PART 2 PRODUCTS

2.1 PIPE FOR SUBDRAINS

Pipe for subdrains shall be of the types and sizes indicated.

2.1.1 Plastic Pipe

Plastic pipe shall contain ultraviolet inhibitor to provide protection from exposure to direct sunlight.

2.1.1.1 Corrugated Polyethylene (PE) Pipe and Fittings

Use ASTM F 405 for pipes 80 3 to 6 inches in diameter, inclusive, ASTM F 667 for pipes 8 to 24 inches in diameter and AASHTO M 252 for pipes 3 to 10 inches in diameter. Fittings shall be manufacturer's standard type and shall conform to the indicated specification.

2.1.1.2 Pipe Perforations

Water inlet area shall be a minimum of 0.5 square inch per linear foot. Manufacturer's standard perforated pipe which essentially meets these requirements may be substituted with prior approval of the Contracting Officer.

a. Circular Perforations in Plastic Pipe: Circular holes shall be cleanly cut not more than 3/8 inch or less than 3/16 inch in diameter and arranged in rows parallel to the longitudinal axis of the pipe. Perforations shall be approximately 3 inches center-to-center along rows. The rows shall be approximately 1-1/2 inches apart and arranged in a staggered pattern so that all perforations lie at the midpoint between perforations in adjacent rows. The rows shall be spaced over not more than 155 degrees of circumference. The spigot or tongue end of the pipe shall not be perforated for a length equal to the depth of the

socket, and perforations shall continue at uniform spacing over the entire length of the pipe.

b. Slotted Perforations in Plastic Pipe: Circumferential slots shall be cleanly cut so as not to restrict the inflow of water and uniformly spaced along the length and circumference of the tubing. Width of slots shall not exceed 1/8 inch nor be less than 1/32 inch. The length of individual slots shall not exceed 1-1/4 inches on 3 inch diameter tubing, 10 percent of the tubing inside nominal circumference on 4 to 8 inch diameter tubing, and 2-1/2 inches on 10 inch diameter tubing. Rows of slots shall be symmetrically spaced so that they are fully contained in 2 quadrants of the pipe. Slots shall be centered in the valleys of the corrugations of profile wall pipe.

2.2 FILTER FABRIC

Filter fabric shall be a pervious sheet of polyester, nylon, or polypropylene filaments woven or otherwise formed into a uniform pattern with distinct and measurable openings. The filter fabric shall provide an equivalent opening size (AOS) no finer than the US Standard Sieve No. 100 and no coarser than the US Standard Sieve No. 70. AOS is defined as the number of the US Standard sieve having openings closest in size to the filter fabric openings. The fabric shall have a minimum physical strength of 16,632 N per meter 95 pounds per inch in any direction when tested in accordance with ASTM D 5034 using the grab test method with 1 square inch jaws and a constant rate of travel of 12 inches per minute. Elongation at failure shall be between 30 and 70 percent. The fabric shall be constructed so that the filaments will retain their relative position with respect to each other.

2.3 SUBDRAIN FILTER AND BEDDING MATERIAL

Subdrain filter and bedding material shall be washed sand, sand and gravel, crushed stone, crushed stone screenings, or slag composed of hard, tough, durable particles free from adherent coatings. Filter material shall not contain corrosive agents, organic matter, or soft, friable, thin, or elongated particles and shall be evenly graded between the limits specified in TABLE I. Gradation curves will exhibit no abrupt changes in slope denoting skip or gap grading. Filter materials shall be clean and free from soil and foreign materials. Filter blankets found to be dirty or otherwise contaminated shall be removed and replaced with material meeting the specific requirements, at no additional cost to the Government.

TABLE I. FILTER GRADATION

Sieve Designatio n	Percent by Weight Passing
12.5 mm	100
6.3 mm	20-100
2.0 mm	0-15
0.85 mm	0-5

PART 3 EXECUTION

3.1 EXCAVATION AND BEDDING FOR SUBDRAIN SYSTEMS

Trenching and excavation, including the removal of unstable

material, shall be in accordance with Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Bedding material shall be placed in the trench as indicated or as required as replacement materials used in those areas where unstable materials were removed. Compaction of the bedding material shall be as specified for cohesionless material in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.2 INSTALLATION OF FILTER FABRIC AND PIPE FOR SUBDRAINS

3.2.1 Installation of Filter Fabric and Overlaps on Perforated or Slotted Pipe.

One layer of filter fabric shall be wrapped around perforated or slotted collector pipes in such a manner that longitudinal overlaps of fabric are in unperforated or unslotted quadrants of the pipes. The overlap shall be at least 2 inches. The fabric shall be secured to the pipe in such a manner that backfill material will not infiltrate through any fabric overlaps. Prefabricated and factory-installed filter fabric sheaths are acceptable.

3.2.2 Installation of Pipe for Subdrains

3.2.2.1 Pipelaying

Each pipe shall be carefully inspected before it is laid. Any defective or damaged pipe shall be rejected. No pipe shall be laid when the trench conditions or weather is unsuitable for such work. Water shall be removed from trenches by sump pumping or other approved methods. The pipe shall be laid to the grades and alignment as indicated. The pipe shall be bedded to the established gradeline. Perforations shall be centered on the bottom of the pipe. Pipes of either the bell-and-spigot type or the tongue-and-groove type shall be laid with the bell or groove ends upstream. All pipes in place shall be approved before backfilling.

3.2.2.2 Jointings

Perforated Corrugated Polyethylene Pipe: Perforated corrugated polyethylene drainage pipe shall be installed in accordance with the manufacturer's specifications and as specified herein. A pipe with physical imperfections shall not be installed. No more than 5 percent stretch in a section will be permitted.

3.3 INSTALLATION OF FILTER MATERIAL AND BACKFILLING FOR SUBDRAINS

After pipe for subdrains has been laid, inspected, and approved, filter material shall be placed around and over the pipe to the depth indicated. The filter material shall be placed in layers not to exceed 8 inches thick, and each layer shall be thoroughly compacted by mechanical tampers or rammers to obtain the required density. Compaction of filter material and the placement and compaction of overlying backfill material shall be in accordance with the applicable provisions specified in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.4 TESTS

3.4.1 Pipe Test

Strength tests of pipe shall conform to field service test requirements of the ASTM specification, or AASHTO specification covering the product (paragraph PIPE FOR SUBDRAINS).

END OF SECTION 02710

SECTION 02720

STORM-DRAINAGE SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO-01	(1992; interim specs 1993 w/errata) Standard Specifications for Highway Bridges
AASHTO M 190	(1980; Rev 1986) Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M 243	(1981; Rev 1986) Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M 294	(1991I) Corrugated Polyethylene Pipe, 12- to 36-in. Diameter

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 798	(1988) Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications
ASTM A 807	(1988) Installing Corrugated Steel Structural Plate Pipe for Sewers and Other Applications
ASTM C 12	(1991) Installing Vitrified Clay Pipe Lines
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu.ft.
ASTM D 2167	(1984; R 1990) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2321	(1989) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3350	(1984) Polyethylene Plastic Pipe and Fittings Materials

ASTM F 714	(1990) Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
ASTM F 894	(1992) Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-06 Instructions

Placing Pipe; FIO.

Printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.

SD-13 Certificates

Determination of Density; FIO.

Certified copies of test reports demonstrating conformance to applicable pipe specifications, before pipe is installed. Certification on the ability of frame and cover or gratings to carry the imposed live load.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Gasket materials and plastic materials shall be protected from exposure to the direct sunlight over extended periods.

1.3.2 Handling

Materials shall be handled in such a manner as to insure delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 PRODUCTS

2.1 PIPE FOR STORM DRAINS

2.1.1 PE Pipe

The pipe stiffness shall be greater than or equal to 1170/D for cohesionless material pipe trench backfills and greater than or equal to 1990/D for cohesive material pipe trench backfills or installation in an embankment or fill. D is the pipe diameter.

2.1.1.1 Smooth Wall PE Pipe

ASTM F 714 produced from PE certified by the resin producer as meeting the requirements of ASTM D 3350, cell class 335434C.

2.1.1.2 Corrugated PE Pipe

AASHTO M 294 produced from PE certified by the resin producer as meeting the requirements of ASTM D 3350, cell class 315412C or 334433C.

2.1.1.3 Ribbed PE Pipe

ASTM F 894 produced from PE certified by the resin producer as meeting the requirements of ASTM D 3350, cell class 334433C, RSC 160.

2.2 DRAINAGE STRUCTURES

2.2.1 Precast Reinforced Concrete Manhole Sections

Precast reinforced concrete sections shall conform to ASTM C 478, except that portland cement shall be as specified herein. Joints shall be cement mortar, or an approved mastic or rubber gasket, or an approved combination of these types.

2.2.2 Frames and Covers

Frames and covers shall be cast iron of type shown and noted on the Drawings sections.

2.3 MISCELLANEOUS MATERIALS

2.3.1 PVC or PE Plastic Pipes
Water tight joints shall be as recommended by the pipe manufacturer in accordance with the requirements of ASTM D 3212. Other joints shall be soil tight in accordance with AASHTO-01, Division II, Section 23.3.1.5.4.

PART 3 EXECUTION

3.1 EXCAVATION FOR STORM DRAINS, AND DRAINAGE STRUCTURES

Excavation of trenches and for appurtenances and backfilling for culverts and storm drains shall be in accordance with the applicable portions of Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS and Section 02225 EARTHWORK FOR DRIVEWAYS, AND PARKING AREAS and the requirements specified below.

3.1.1 Trenching

The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 8 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing where required shall be placed within the trench width as specified. Care should be taken not to overexcavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

3.1.2 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the

pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor in his performance of shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the government.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded carefully in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe or to the lower curved portion of pipe arch for the entire length of the pipe or pipe arch. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type of joint. Bedding for clay pipe shall be as specified by ASTM C 12. Bedding for corrugated metal pipe and pipe arch shall be in accordance with ASTM A 798. It is not required to shape the bedding to the pipe geometry. However, for arches, it is recommended to either shape the bedding to the relatively flat bottom arc or fine grade the foundation to a shallow V-shape. Bedding for corrugated structural plate pipe shall meet requirements of ASTM A 807. Bedding for PVC and PE pipe shall meet the requirements of ASTM D 2321 for Class I II and III materials.

3.3 PLACING PIPE

Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated metal pipe shall be placed in the same vertical plane as the major axis of the pipe. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipe in place shall be inspected before backfilling, and those pipes damaged during placement shall be removed and replaced.

3.3.1 Corrugated PE Pipe

Laying shall be with the separate sections joined firmly on a bed shaped to line and grade and shall follow manufacturer's recommendations.

3.4 JOINTS

3.4.1 Flexible Watertight, Gasketed Joints

Installation shall be as recommended by the gasket manufacturer for use of lubricants and cements and other special installation requirements. The gasket shall be placed over one end of a section of pipe for half the width of the gasket. The other half shall be doubled over the end of the same pipe. When the adjoining section of pipe is in place, the doubled-over half of the gasket shall then be rolled over the adjoining section. Any unevenness in overlap shall be corrected so that the gasket covers the end of pipe sections equally. Connecting bands shall then be centered over

adjoining sections of pipe, and rods or bolts placed in position and nuts tightened. Band Tightening: The band shall be tightened evenly, even tension being kept on the rods or bolts, and the gasket shall be closely observed to see that it is seating properly in the corrugations. Watertight joints shall remain uncovered for a period of time designated, and before being covered, tightness of the nuts shall be measured with a torque wrench. If the nut has tended to loosen its grip on the bolts or rods, the nut shall be retightened with a torque wrench and remain uncovered until a tight, permanent joint is assured.

3.5 BACKFILLING

3.5.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 6 inches. Tests for density will be made as necessary to insure conformance to the compaction requirements specified elsewhere in this paragraph. Where it is necessary in the opinion of the Contracting Officer, any sheeting or portions of bracing used shall be left in place and the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

3.5.2 Backfilling Pipe in Fill Sections

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified elsewhere in this paragraph. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 6 inches.

3.5.3 Movement of Construction Machinery

In compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

3.5.4 Compaction

3.5.4.1 General

Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays,

silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

3.5.4.2 Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density (densities) which will be determined as specified in this paragraph.

a. Under airfield and heliport pavements, paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.
b. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.

c. Under nontraffic areas, density shall be not less than that of the surrounding material.

3.5.5 Determination of Density

Testing shall be the responsibility of the Contractor and performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to insure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D 1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017 or ASTM D 2922. Test results shall be furnished the Contracting Officer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

3.6 PIPELINE TESTING

Lines shall be tested for leakage by exfiltration tests. Prior to testing for leakage the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. An exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above

both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be reestablished. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by the exfiltration test shall not exceed 0.2 gallons per inch in diameter per 100 feet of pipeline per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correcting, and retesting shall be made at no additional cost to the Government.

END OF SECTION 02720

SECTION 02730

SANITARY SEWERS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM C 94	(1992a) Ready-Mixed Concrete
ASTM C 150	(1992) Portland Cement
ASTM C 270	(1992a) Mortar for Unit Masonry
ASTM C 443	(1985a; R 1990) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C 478	(1993) Precast Reinforced Concrete Manhole Sections
ASTM C 828	(1990) Low-Pressure Air Test of Vitrified Clay Pipe Lines
ASTM C 924	(1989) Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM D 1784	(1992) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 2680	(1993) Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D 2751	(1993)Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
ASTM D 3034	(1993) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	(1992) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 3350	(1993) Polyethylene Plastics Pipe and Fittings Materials
ASTM D 3753	(1981; R 1991) Glass-Fiber-Reinforced

	Polyester Manholes
ASTM D 3840	(1988) "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications
ASTM F 477	(1993) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 714	(1993) Polyethylene (PE) Plastic pipe (SDR-PR) Based on Outside Diameter
ASTM F 794	(1993a) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F 894	(1993b) Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F 949	(1993a) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 49	(1991) Hazardous Chemicals Data
NFPA 325M	(1991) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids
NFPA 704	(1990) Identification of the Fire Hazards of Materials

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-6	(1990) Recommended Practice for the Low-Pressure Air Testing of Installed Sewer Pipe
UBPPA UNI-B-9	(1990) Recommended Performance Specification for Polyvinyl Chloride (PVC) Profile Wall Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter (Nominal Pipe Sizes 4-48 inch)

1.2 GENERAL REQUIREMENTS

The construction required herein shall include gravity sewers and their appurtenant structures up to a point of connection with the building drains 5 feet outside the water conservation berm or dike wall. The Contractor shall replace damaged material and redo unacceptable work at no additional cost to the Government. Excavation and backfilling is specified in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Backfilling shall be accomplished after inspection by the Contracting Officer.

1.2.1 Protection of Materials

Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to

the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendation and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-13 Certificates

Portland Cement; FIO.

Certificates of compliance stating the type of cement used in manufacture of concrete pipe, fittings and precast manholes.

PART 2 PRODUCTS

2.1 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Plastic Pipe

Acrylonitrile-butadiene-styrene (ABS) and polyvinyl chloride (PVC) composite sewer piping shall conform to ASTM D 2680. Size 6 inch through 15 inch diameter.

2.1.1.1 ABS Pipe

ASTM D 2751.

2.1.1.2 PVC Pipe

ASTM D 3034, Type PSM with a maximum SDR of 35, Size 15 inch or less in diameter. ASTM F 949 for corrugated sewer pipes with a smooth interior. UBPPA UNI-B-9 and ASTM F 794, Series 46, for ribbed sewer pipe with smooth interior, size 6 inch through 48 inch diameters. PVC shall be certified by the compounder as meeting the requirements of ASTM D 1784, cell Class 12454B. The pipe stiffness shall be greater than or equal to 735/D for cohesionless material pipe trench backfills.

2.1.1.3 High Density Polyethylene Pipe

ASTM F 714, size 4 inch through 48 inch. The polyethylene shall be certified by the resin producer as meeting the requirements of ASTM D 3350, cell Class 334433C. The pipe stiffness shall be greater than or equal to 1170/D for cohesionless material pipe trench backfills.

2.2 FITTINGS

Fittings shall be compatible with the pipe supplied and shall have a strength

not less than that of the pipe. Fittings shall conform to the respective specifications and other requirements specified below.

2.2.1 Plastic Pipe

ABS and PVC composite sewer pipe fittings shall conform to ASTM D 2680.

2.2.1.1 ABS Pipe

ASTM D 2751.

2.2.1.2 PVC Pipe

ASTM D 3034 for type PSM pipe. ASTM F 949 for corrugated sewer pipe with a smooth interior. UBPPA UNI-B-9 and ASTM F 794, Series 46, for ribbed sewer pipe with smooth interior.

2.2.1.3 High Density Polyethylene Pipe

ASTM F 894.

2.3 JOINTS

Joints installation shall comply with the manufacturer's instructions.

2.3.1 Plastic Pipe

Flexible plastic pipe (PVC or high density polyethylene pipe) gasketed joints shall conform to ASTM D 3212.

2.3.1.1 ABS Pipe

ASTM D 2751, solvent weld or bell and spigot O-ring joint, 12 inches or less in diameter, dimensions and tolerances in accordance with Table 2 herein.

2.3.1.2 High Density Polyethylene Pipe

Rubber gasket joints shall conform to ASTM C 443.

2.4 BRANCH CONNECTIONS

Branch connections shall be made by use of regular fittings or solvent cemented saddles as approved. Saddles for ABS and PVC composite pipe shall conform to Figure 2 of ASTM D 2680; saddles for ABS pipe shall comply with Table 3 of ASTM D 2751; and saddles for PVC pipe shall conform to Table 4 of ASTM D 3034.

2.5 CEMENT MORTAR

Cement mortar shall conform to ASTM C 270, Type M with Type II cement.

2.5.1 Portland Cement

Portland cement shall conform to ASTM C 150, Type II for concrete used in concrete pipe, and type optional with the Contractor for cement used in concrete cradle, concrete encasement, and thrust blocking.

2.5.2 Portland Cement Concrete

Portland cement concrete shall conform to ASTM C 94, compressive strength of 4000 psi at 28 days, except for concrete cradle and encasement or concrete blocks for manholes. Concrete used for cradle and encasement shall have a compressive strength of 2500 psi minimum at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Adjacent Facilities

3.1.1.1 Water Lines

Where the location of the sewer is not clearly defined by dimensions on the drawings, the sewer shall not be closer horizontally than 10 feet to a water-supply main or service line, except that where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, the horizontal spacing may be a minimum of 6 feet. Where gravity-flow sewers cross above water lines, the sewer pipe for a distance of 10 feet on each side of the crossing shall be fully encased in concrete or shall be acceptable pressure pipe with no joint closer horizontally than 3 feet to the crossing. The thickness of the concrete encasement including that at the pipe joints shall be not less than 4 inches.

3.1.2 Pipe Laying

a. Pipe shall be protected during handling against impact shocks and free fall and the pipe interior shall be free of extraneous material.

b. Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow. Each pipe shall be laid accurately to the line and grade shown on the drawings. Pipe shall be laid and centered so that the sewer has a uniform invert. As the work progresses, the interior of the sewer shall be cleared of all superfluous materials.

c. Before making pipe joints all surfaces of the portions of the pipe to be joined shall be clean and dry. Lubricants, primers, and adhesives shall be used as recommended by the pipe manufacturer. The joints shall then be placed, fitted, joined, and adjusted to obtain the degree of water tightness required.

d. ABS composite pipe ends with exposed truss and filler material shall be coated with solvent weld material before making the joint to prevent water or air passage at the joint between the inner and outer wall of the pipe.

e. Installations of solvent weld joint pipe, using ABS or PVC pipe and fittings shall be in accordance with ASTM F 402. All required precautions shall be taken to assure adequate trench ventilation and protection for workers installing the pipe.

3.1.2.1 Caulked Joints

The packing material shall be well packed into the annular space to prevent the entrance of lead into the pipe. The remainder of the space shall be filled with molten lead that is hot enough to show a rapid change in color when stirred. Scum shall be removed before pouring. The lead shall be caulked to form a tight joint without overstraining the bell and shall have

a minimum depth of 1 inch after caulking.

3.1.2.2 Trenches

Trenches shall be kept free of water and as dry as possible during bedding,

laying, and jointing and for as long a period as required. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings.

3.1.2.3 Backfill

As soon as possible after the joint is made, sufficient backfill material shall be placed along the pipe to prevent pipe movement off line or grade. Plastic pipe shall be completely covered to prevent damage from ultraviolet light.

3.1.2.4 Width of Trench

If the maximum width of the trench at the top of the pipe, as specified in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, is exceeded for any reason other than by direction, the Contractor shall install at no additional cost to the Government such concrete cradling, pipe encasement, or other bedding required to support the added load of the backfill.

3.1.2.5 Joints

Joints between different pipe materials shall be made as specified, using approved jointing materials.

3.1.2.6 Handling and Storage

Pipe, fittings and joint material shall be handled and stored in accordance with the manufacturer's recommendations. Storage facilities for plastic pipe, fittings, joint materials and solvents shall be classified and marked in accordance with NFPA 704, with classification as indicated in NFPA 49 and NFPA 325M.

3.1.3 Leakage Tests

Lines shall be tested for leakage by low pressure air testing, infiltration tests or exfiltration tests, as appropriate. Low pressure air testing for PVC pipe shall be as prescribed in UBPPA UNI-B-6. Low pressure air testing procedures for other pipe materials shall use the pressures and testing times prescribed in ASTM C 828 and ASTM C 924, after consultation with the pipe manufacturer. Prior to infiltration or exfiltration tests the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. When the Contracting Officer determines that infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum

absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 0.2 gallons per inch diameter per 100 feet of pipeline per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correction, and retesting shall be made at no additional cost to the Government.

3.1.4 Test for Deflection

When flexible pipe is used, a deflection test shall be made on the entire length of the installed pipeline not less than 30 days after the completion of all work including the leakage test, backfill, and placement of any fill, grading, paving, concrete, or superimposed loads. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. The ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 92.5 percent of the inside diameter of the pipe, but 95 percent for RPMP and RTRP. A tolerance of plus 0.5 percent will be permitted. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. It shall be center bored and through-bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of 70,000 psi or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer such that a pull exerted on the opposite end of the shaft shall produce compression throughout the remote end of the ball, cylinder or circular section. Circular sections shall be so spaced that the distance from the external faces of the front and back sections shall equal or exceed the diameter of the circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through or by being flushed through with water, shall be cause for rejection of that run. When a deflection device is used for the test in lieu of the ball, cylinder, or circular sections described, such device shall be approved prior to use. The device shall be sensitive to 1.0 percent of the diameter of the pipe being measured and shall be accurate to 1.0 percent of the indicated dimension. Installed pipe showing deflections greater than 7.5 percent of the normal diameter of the pipe, or 5 percent for RTRP and RPMP, shall be retested by a run from the opposite direction. If the retest also fails, the suspect pipe shall be replaced at no cost to the Government.

3.2 CONCRETE CRADLE AND ENCASEMENT

The pipe shall be supported on a concrete cradle, or encased in concrete where indicated or directed.

3.3 WYE BRANCHES

Wye branches shall be installed where sewer connections are indicated or where directed. Cutting into piping for connections shall not be done except in special approved cases. When the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, the pipe shall be encased in concrete backfill or supported on a concrete cradle as directed. Concrete required because of conditions resulting from faulty construction methods or negligence by the Contractor shall be installed at no additional cost to the Government. The installation of wye branches in an existing sewer shall be made by a method which does not damage the integrity of the existing sewer. One acceptable method consists of removing one pipe section, breaking off the upper half of the bell of the

next lower section and half of the running bell of wye section. After placing the new section, it shall be rotated so that the broken half of the bell will be at the bottom. The two joints shall then be made with joint packing and cement mortar.

3.4 CLEANOUTS, AND OTHER APPURTENANCES

3.4.1 Cleanouts and other appurtenances shall be installed where shown on the drawings or as directed by the Contracting Officer, and shall conform to the detail of the drawings.

END OF SECTION 02730

SECTION 02732

FORCE MAINS AND INVERTED SIPHONS; SEWER

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 6D	(1991; Supple 1) Pipeline Valves (Gate, Plug, Ball, and Check Valves)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 478	(1990b) Precast Reinforced Concrete Manhole Sections

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C110	(1987) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
AWWA C111	(1990) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115	(1988) Flanged Ductile-Iron Pipe with Threaded Flanges
AWWA C151	(1991) Ductile-Iron Pipe, Centrifugally Cast for Water or Other Liquids
AWWA C500	(1993; C508a) Gate Valves for Water and Sewerage Systems
AWWA C508	(1982) Swing-Check Valves for Waterworks Service, 2 In. Through 24 In. NPS
AWWA C600	(1987) Installation of Ductile-Iron Water Mains and Their Appurtenances

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)

DIPRA-01	(1989) Thrust Restraint Design for Ductile Iron Pipe

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01305 SUBMITTAL PROCEDURES:

SD-09 Reports

Hydrostatic Tests FI0.

Copies of test results.

1.3 DELIVERY AND STORAGE

All material delivered and stored shall be handled and stored in such a manner that pipe, fittings and accessories, and pipe coatings are not damaged.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

Piping for force mains shall be ductile iron pipe with bolted flange joints. Pipe shall conform to the respective specifications and other requirements specified below. Provide transition as appropriate at tie-in between existing and new piping material.

2.1.1 Ductile Iron Pipe

a. Ductile Iron Pipe: AWWA C151, working pressure not less than 150 psi unless otherwise shown or specified.

b. River Crossing Pipe: AWWA C151, minimum thickness Class 54 with joints in compliance with applicable requirements of AWWA C110.

c. Fittings, Mechanical: AWWA C110, rated for 150 psi.

d. Fittings, Push-On: AWWA C110 and AWWA C111, rated for 150 psi.

2.2 JOINTS

2.2.1 Ductile Iron Pipe

a. Push-on Joints: AWWA C111.

b. Mechanical Joints: AWWA C111 as modified by AWWA C151.

c. Flanged Joints: AWWA C115.

2.3 VALVES

2.3.1 Gate Valves

Gate valves 3 inches and larger shall comply with AWWA C500. Valves for buried service shall be non-rising stem (NRS), 2 inch square nut operated with joints applicable to the pipe or installation. Buried valves shall be furnished with extension stems comprising socket, extension stem and operating nut, and shall be of an appropriate length to bring operating nut to within 6 inches of grade. One 4 foot "T" handle valve wrench shall be furnished for each quantity of 6 buried valves. Gate valves that are exposed or installed inside shall be outside screw and yoke (OS&Y), handwheel operated with flange ends unless otherwise indicated. Gate valve operating nuts and handwheels shall have an arrow and the word "OPEN" cast in raised letters to indicate the direction of opening. Gate valves 14 inches and larger shall be equipped with gearing to reduce operating effort. Gate valves 14 inches and larger installed in horizontal lines in horizontal position with stems horizontal shall be equipped with bronze track, roller and scrapers to support the weight of the gate for its full length of travel. Gate valves 14 inches and larger installed in vertical pipe lines with stems horizontal shall be fitted with slides to assist the travel of the gate assembly.

2.3.2 Check Valves

Check valves shall permit free flow of sewage forward and provide a positive check against backflow. Check valves shall be designed for a minimum working pressure of 150 psi or as indicated. The body shall be iron. The manufacturer's name, initials, or trademark and also the size of the valve, working pressure, and direction of flow shall be directly cast on the body.

a. Ball Check Valves shall be iron body, shall have flanged ends, and shall be the non-slam type. Flanges shall be the Class 125 type complying with ASME B16.1. Ball shall be stainless steel unless otherwise specified.

b. Swing Check Valves shall comply with AWWA C508 and shall be iron body, bronze mounted, and shall have flanged ends. Flanges shall be the Class 125 type complying with ASME B16.1.

2.3.3 Plug Valves

Steel plug valves shall comply with API Spec 6D.

2.4 VALVE VAULTS

Valve vaults shall be precast concrete units conforming to ASTM C 478.

2.5 MISCELLANEOUS MATERIALS

Miscellaneous materials shall comply with the following requirements:

2.5.1 Joint Lubricants

Joint lubricants shall be as recommended by the pipe manufacturer.

2.5.2 Bolts, Nuts and Glands

AWWA C111.

2.5.3 Joint Compound

A stiff mixture of graphite and oil or inert filler and oil.

2.5.4 Bond Wire

Bond wire type RHW or USE, Size 1/0 AWG, neoprene jacketed copper conductor shaped to stand clear of the joint.

PART 3 EXECUTION

3.1 INSTALLATION

Pipe, pipe fittings, and appurtenances shall be installed at the locations indicated. Excavation, trenching, and backfilling shall be as specified in Section 02222 EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES SYSTEMS.

3.1.1 Adjacent Facilities

Installation of force mains and inverted siphons near adjacent facilities shall be as specified in Section 02730 SANITARY SEWERS.

3.1.2 Cutting

Pipe shall be cut in a neat manner with mechanical cutters. Wheel cutters shall be used where practicable. Sharp and rough edges shall be ground smooth and loose material removed from the pipe before laying.

3.1.3 Laying

Except where otherwise authorized, pipe shall be laid with bells facing the direction of laying. Before lowering and while suspended, the pipe shall be inspected for defects. Defective material shall be rejected. Pipe shall be laid in compliance with the following:

a. Ductile Iron: AWWA C600.

3.1.4 Jointing

3.1.4.1 Ductile Iron Pipe

Installation of mechanical and push-on type joints shall comply with AWWA C600 and the manufacturer's instructions. Installation of flanged joints shall comply with manufacturer's instructions.

3.1.5 Lining

Flaws and holidays in the lining of the pipe and the pipe joints shall be repaired such that the repaired areas will be at least equal in thickness to the minimum required for the pipe. Valves shall be installed in valve vaults as indicated.

3.1.6 Valves

Prior to installation, valves shall be cleaned of all foreign matter and inspected for damage. Valves shall be fully opened and closed to ensure that all parts are properly operating. Valves shall be installed in valve vaults as indicated.

3.1.7 Valve Vaults

Valve vaults shall be installed as indicated.

3.1.8 Drain Lines

Drain lines shall be installed where indicated. The drain line shall consist of a tee in the main line with a 4 inch diameter branch, a 4 inch diameter elbow, and a 4 inch gate valve.

3.1.9 Thrust Restraint

Plugs, caps, tees and bends deflecting 11-1/4 degrees or more, either vertically or horizontally, shall be provided with thrust restraint. Valves shall be securely anchored or shall be provided with thrust restraints to prevent movement. Thrust restraints shall be either thrust blocks or, for ductile-iron pipes, restrained joints.

3.1.9.1 Thrust Blocks

Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 2000 psi after 28 days. Blocking shall be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting joints will be accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

3.1.9.2 Restrained Joints

For ductile-iron pipe, restrained joints shall be designed by the Contractor or the pipe manufacturer in accordance with DIPRA-01.

3.1.10 Bonded Joints

Where indicated, a metallic bond shall be provided at each joint, including joints made with flexible couplings or rubber gaskets, of ferrous-metallic piping to effect continuous conductivity. The bond shall be of the thermal-weld type.

3.2 HYDROSTATIC TESTS

The pipeline shall be subjected to both a pressure test and a leakage test. Testing shall be performed by an approved independent testing laboratory or by the Contractor subject to approval. The Contracting Officer shall be notified of least 7 days in advance of equipment tests. The final test report shall be delivered to the Contracting Officer within 30 days of the test.

3.2.1 Pressure Test

After the pipe has been installed, joints completed, thrust blocks have been in place for at least five days, and the trench has been partially backfilled, leaving the joints exposed for examination, the pipe shall be filled with water in a manner to expel all air. The pipeline shall be subjected to a test pressure of 100 psi or 150 percent of the working pressure, whichever is greater, for a period of at least one hour. Each valve shall be opened and closed several times during the test. The exposed pipe, joints, fitting, and valves shall be examined for leaks. Visible leaks shall be stopped or the defective pipe, fitting, joints, or valve shall be replaced.

3.2.2 Leakage Test

The leakage test may be conducted subsequent to or concurrently with the pressure test. The amount of water permitted as leakage for the line shall be placed in a sealed container attached to the supply side of the test pump. No other source of supply will be permitted to be applied to the pump or line under test. The water shall be pumped into the line by the test pump as required to maintain the specified test pressure as described for pressure test for a 2-hour period. Exhaustion of the supply or the inability to maintain the required pressure will be considered test failure. Polyethylene pipe can experience diametric expansion and pressure elongation during initial testing. The manufacturer shall be consulted prior to testing for special testing considerations. Allowable leakage shall be determined by the following formula:

L = NDP/K Where:
L = Allowable leakage in gallons per hour.
N = Number of joints in length of pipeline tested.
D = Nominal diameter of the pipe in inches.
P = Square root of the test pressure in psig.
K = 7400 for pipe materials.

At the conclusion of the test, the amount of water remaining in the container shall be measured and the results recorded in the test report.

3.2.3 Retesting

If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be reconducted until the results of the tests are within specified allowances without additional cost to the Government.

End of Section O2732

SECTION 02775

MANUAL LEAK MONITORING SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1598	Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
ASTM D 1599	Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings
ASTM D 2122	Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings
ASTM D 2321	Underground Installation of Flexible Thermoplastic Sewer Pipe
ASTM D 2657	Practice for Heat-Joining Polyolefin Pipe and Fittings
ASTM D 2683	Socket Type Polyethylene Fittings for SDR 11.0 Polyethylene Pipe
ASTM D 3350	Polyethylene Plastics Pipe and Fittings
ASTM F 714	Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
ASTM F 810	Smoothwall Polyethylene (PE) Pipe for Use in Drainage and Waste Disposal Absorption Fields

1.2 RELATED REQUIREMENTS

a. Section 02221, Excavation, Filling and Backfilling for Structures.

b. Section 02225, Earthwork for Driveways and Parking Areas.

1.3 SYSTEM REQUIREMENTS

1.3.1 Section Includes

Containment system leak monitoring for both the liner and the double-containment piping.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTION:

SD-01 Data

Manufacturer's Catalog; FIO

Fittings, Joints and Couplings; GA

SD-06 Instructions

Manufacturer's Instructions; GA

Pipe Installation; GA

SD-13 Certificates

Certificates of Compliance; GA

Pipe and Fittings; GA

Pipe Joint Material; GA

Welder Ceritification; GA

SD-19 Operations and Maintenance Manuals

Operations and Maintenance Manuals; GA

1.5 WELDER CERTIFICATION

Provide welder certification in accordance with ASTM D2657.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Pipe Materials

a. Polyethylene Pipe: ASTM F 714; High-density, manufactured from Type PE 3408 material and DR11 wall thickness; two rows of perforations per ASTM F 810 in perforated pipe.

b. Pipe Fittings: ASTM D 2683; Socket Fittings.

c. HDPE Pipe and Fittings: ASTM D3408, cell classification 345434C or 355434C. Both the inner and outer pipes and all fittings shall be pressure-rated 45 psi at 68^0F.

2.2 ACCESSORIES

Section 02776: Lining System.

PART 3 EXECUTION

3.1 EXAMINATION

Verify that trench cut or excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.2 PREPARATION

a. Trim excavations to required elevations. Correct over excavation with fill material of type required by drawings.

b. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 INSTALLATION

a. Install and join pipe and pipe fittings in accordance with ASTM D 2657 and ASTM D 2321.

b. Place pipe with perforations facing down.

c. Lay pipe to grade noted on drawings.

d. Wrap perforated pipe with filter fabric.

e. Place backfill in maximum 8-in. lifts, consoliating each lift.

f. Install double-containment piping to comply with manufacturer’s recommended procedure.

3.4 FIELD QUALITY CONTROL

Perform a single test of the annular space, in lieu of testing the inner and outing pipes independently, to verify the integrity of the double-pipe system. The test shall be conducted per manufacturer’s recommendation.

3.5 PROTECTION

a. Protect finished installation.

b. Protect pipe from damage or displacement during backfill operation.

END OF SECTION 02775

SECTION 02776

LINING SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D413	1982 (R 1988) Rubber Property - Adhesion to Flexible Substrate
ASTM D638	1989 Tensile Properties of Plastics
ASTM D746	1979 (R 1987) Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D751	1979 Coated Fabrics
ASTM D882	1988 Standard Test Methods for Tensile Properties of Thin Plastic Sheeting
ASTM D1004	1966 (R 1988) Initial Tear-Resistance of Plastic Film and Sheeting
ASTM D1149	1986 Rubber Deterioration - Surface Ozone Cracking in a Chamber
ASTM D1204	1984 Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
ASTM D1238	1982 Flow Rates of Thermoplastics by Extrusion Plastometer, Test Method for
ASTM D1505	1985 Standard Test Method for Density of Plastics by the Density-Gradient
ASTM D1603	1988 Standard Test Method for Carbon Black
ASTM D3083	1976 (R 1980) Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining
ASTM D3776	1987 Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabric: Diaphragm Bursting Strength Tester Method

ASTM D4632	1986 Breaking Load and Elongation of Geotextiles (Grab Method)
ASTM D4751	Determining Apparent Opening Size of a Geotextile

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. the following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Manufacturer's Catalog; FIO

Drainage net; GA

Geotextile filter fabric; GA

Splicing cement; GA

Penetration sleeves; GA

SD-4 Drawings

Liner system; GA

Indicate sheet and seam layout, anchorage details, and penetration details.

SD-06 Instructions

Manufacturer's Instructions; FIO

Liner; GA

Seaming adhesive; GA

Application; GA

Protection; GA

Corrections; GA

SD-08 Quality Control (CQ)

Manufacturer's Installation Instructions; FIO

Procedures and Requirements; FIO

SD-13 Certificates

Liner; GA

Geotextile Filter fabric; GA

1.3 DELIVERY AND STORAGE

Deliver liner and geotextile filter fabric to site in largest sizes possible to minimize field seaming. Protect from sunlight and other ultraviolet light sources during storage. Keep cements and adhesives from extreme cold or heat. Keep materials clean and dry prior to use with polyethylene or canvas covering. Provide liner and containers that have the manufacturer's label and identify type of material.

PART 2 PRODUCTS

2.1 LINER

2.1.1 High-Density Polyethylene (HDPE) Liner Material

High-density polyethylene (HDPE) flexible membrane liner and netting reinforcement, average total composite thickness of 1/4 inch. Liner (HDPE) material shall be in accordance with the following:

Property	Test Method	Minimum Requirements
Total Overall Thickness	ASTM D1505	60 mils
Minimum Tensile Properties	ASTM D638 Type IV	(each Direction):
a. Tensile Strength at Break		240 lbs/inch width
b. Tensile Strength at Yield		140 lbs/inch width
c. Elongation @ Break		700%
d. Elongation @ Yield		13%
e. Modules of Elasticity		90,000 lbs/sq.in.
Tear-Resistance Initiation	ASTM D1004 DIE C	45 lbs. minimum
Low-Temperature Brittleness	ASTM D746 Procedure B	Minus 107 deg. F.
Tensile Properties (Each Direction)	ASTM D1204	Minimum (Each Direction +/- 2% max change
Resistance to Soil Burial ASTM D638 Type IV	ASTM D3083 using	Max. % change in Original Value
Tensile Strength @	@ change	+/- 10%
Ozone Resistance	ASTM D1149	No Cracks

Property	Test Method	Minimum Requirements
Puncture Resistance Method 2065	FTMS 101B	80
Hydrostatic Resistance (Lbs inch Square)	ASTM D751 Method A Procedure 1	650

2.1.2 Drainage Net Material

High-density polyethylene, HDPE mesh in accordance with the following:

Weight Per Square Foot	ASTM D1505	0/20 lbs/sq/ft
Specific Gravity (G/cubic cm)	ASTM D1505	> 0.94
Melt Flow Index	ASTM D1238	< 0.25 (g/10 min.)
Thickness	Micrometer Measurement at Strand Intersection	5.0 - 6.0 mm 200 mil - 265 mil 0.200 - 0.265 -in.
Percent Carbon Black	ASTM D1603	2 -3%
	50 mm X 125 mm specimen pulled apart at 50 mm/minute	
Tensile Break Strength	(2in. x 5in. specimen pulled apart at 2in./minute)	
Machine//Roll Direction		50 lbs
Cross Direction		30 lbs
UV Stability		Resistant to UV
Transmissivity (minimum)	10,000 psf compressive load between two layers of HDPE liner; 0.25 Hydraulic Gradient	10 g/min./ft.

2.1.3 Geotextile Filter Fabric Material

a. Nonwoven fabric manufactured from material whose use is compatible with petroleum products.

b. Minimum puncture strength of fabric, mean average roll value (MARV), equal to or greater than 120 lb when tested in accordance with ASTM 4873.

c. Minimum weight of fabric equal to or greater than 4 oz./sq.yd as determined by ASTM D3776.

d. Apparent opening size in fabric, MARV, minimum 100 and maximum 50, as tested in accordance with ASTM D 4751.

2.2 SPLICING CEMENT

Provide seaming adhesive as recommended by manufacturer to be compatible with type of liner used.

2.3 PENETRATIONS

Provide and install in accordance with manufacturer's standard factory-fabricated penetration assemblies.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Prepare subgrade in accordance with Section 02221, "Excavation, Filling and Backfilling for Structures." Remove vegetation, boulders and rocks larger than 3/4-inch in size and other sharp objects. Fill in holes, including stake holes. Inspect subgrade surface and correct defects prior to continuing construction. Do not proceed with geotextile filter fabric installation until sub-surface is acceptable to manufacturers' requirements.

3.1.1 Concrete

Provide concrete surfaces and pipe anchorages in accordance with Section 03300, "Concrete for Building Construction." Provide smooth surfaces with no sharp projections or abrupt surface changes. Compact earth within 12 inches of any concrete surfaces to 100 percent maximum density, optimum moisture as specified in Section 02221, "Excavation, Filling and Backfilling for Structures."

3.2 CLEANING OF LINER MATERIAL

Clean liner sheets of dust, dirt, and other foreign matter. Carefully clean area (both mating surfaces) of seams.

3.3 GEOTEXTILE FILTER FABRIC INSTALLATION

a. Apply fabric to surface with sufficient slack to prevent tearing when cover material is placed.

b. Lap fabric edges a minimum of 12 inches. to prevent separation at edges when COVER MATERIAL is placed.

c. Lap end joints a minimum of 3 feet.

d. Place a minimum of 6 inches of cover material over fabric prior to operating equipment on fabric-covered area.

3.4 LINER INSTALLATION

3.4.1 Placement

Installation of liner and drainage net, including penetration seals and field joints, to be performed in accordance with manufacturers' drawings and detailed instruction.

3.5 ANCHORAGE

3.5.1 Earth Anchorage

Make perimeter trench as indicated. After installation of liner in reservoir is complete, place liner in perimeter trench. Backfill trench.

3.5.2 Anchorage to Structures

Remove curing compounds and coatings from structures in joint areas. Use bonding adhesive recommended by manufacturer to make joints. Make joint to structures at least 12 inches wide.

3.6 BACKFILL OVER LINER

Cover installed liner with earth to depth indicated. Place earth on liner using rubber tired vehicles. Drive only on earth cover. Correct any damage to liner caused by covering operations.

3.7 CORRECTION

Repair leaks and defective areas in accordance with manufacturer's recommendations.

3.8 FIELD QUALITY CONTROL

3.8.1 INSPECTION

Inspect completed geotextile filter fabric and liner for pinholes, punctures, and tears seams and joints for unbonded areas. Repair defects as specified by the manufacturer. The Contracting Officer and Manufacturer's Representative shall observe conditions of subbase and liner prior to installation. Inspect for uniform 6-inch overlap of seams and observe that backfill is not causing seams to open.

3.8.2 Geotextile Filter Fabric quality Control

a. Inspect fabric to ensure edges have been lapped properly.

b. Inspect fabric for torn or damaged areas.

3.8.3 Liner Quality Control

a. Manufacturing. The quality control (QC) plan submitted by the liner manufacturer shall provide for certification that all liner and mesh materials shipped to the site meet the following minimum criteria.
   1. All material is HDPE in accordance with the manufacturers' specification.
   2. Membrane sheets are free from leaks and pinholes.
   3. All HDPE meets the requirements of EPA Test Procedure 9090 for exposure to JP-4.
   4. All factory welds are leak-free in accordance with National Sanitation Foundation Standard 54 for Flexible Membrane Liners, dated November 1983.
   5. Material thickness is as specified.
   6. Tensile strength for each lot of material is within specification.

b. Installation. The liner shall be checked to verify compliance with the submitted QC plan for installation. The following QC actions shall be required as a minimum:

1. All field welds shall be permanently marked with an identification number.

2. All field welds shall be leak-tested and certified to be leak free.

3. Tensile tests shall be performed on samples taken from both ends of each field weld. If either test is out of specification, the entire weld shall be repaired.

4. The FML shall be protected from above by 6-in. of sand that is free from rock, fractured stone, debris, rubble, rubbish, and roots or by multiple layers of filter fabric.

5. The FML shall be protected from above by 6-in. of sand that is free from rock, fractured stone, debris, rubble, rubbish, roots, or other sharp objects. The surface shall be smooth, compacted, uniform, and free from sudden changes in grade.

6. There shall be no bridging or stressed conditions in the liner.

7. Tears, punctures, or other defects in the liner shall be repaired, tested, and certified to be leak-free by the installer at no cost to the Government.

c. Certification. The manufacturer/installer shall provide signed check sheets verifying that all manufacturing and installation QC requirements have been met. The field check sheets shall also be signed by the company to indicate acceptance of received materials, subsurface preparation, field welds, and field weld leak tests.

END OF SECTION 02776

SECTION 02831

CHAIN LINK FENCE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 94	(1992a) Ready-Mixed Concrete
ASTM F 883	(1990) Padlocks

AMERICAN WELDING SOCIETY (AWS)

AWS WZC	(1972) Welding Zinc-Coated Steels

FEDERAL SPECIFICATIONS (FS)

FS RR-F-191/GEN	(Rev K) Fencing, Wire and Post Metal (and Gates, Chain-Link Fence Fabric, and Accessories)
FS RR-F-191/1	(Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Fabric)
FS RR-F-191/2	(Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Gates)
FS RR-F-191/3	(Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
FS RR-F-191/4	(Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings

Chain Link Fence; FIO.

Drawings showing post sizes and sections; post setting and bracing; gate details; details of attachment of fabric and any other details required to erect the fence along the lines indicated.

SD-13 Certificates
Chain Link Fence; GA

Statement signed by an official authorized to certify on behalf of the manufacturer attesting that the chain link fence and component materials meet the specified requirements.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the following:

2.1.1 Chain Link Fence

FS RR-F-191/GEN.

2.1.1.1 Fabric

FS RR-F-191/1, Type I, zinc-coated steel wire with minimum coating weight of 1.2 ounces of zinc per square foot of coated surface, or Type II, aluminum-coated steel wire. Fabric shall be fabricated of 9-gauge wire woven in 2-inch mesh. Fabric height shall be 6 or 7 feet as shown. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.

2.1.1.2 Gates

FS RR-F-191/2. Gate shall be the type and swing shown. Gate frames shall be constructed of Class 1 Grade A or B, steel pipe, size SP2, as specified in FS RR-F-191/3. Gate fabric shall be as specified for chain-link fabric. Each end member of gate frames shall be extended sufficiently above the top member to carry three strands of barbed wire in horizontal alignment with barbed wire strands on the fence. Gate leaves more than 8 feet wide shall have either intermediate members and diagonal truss rods or shall have tubular members as necessary to provide rigid construction, free from sag or twist. Gate leaves less than 8 feet wide shall have truss rods or intermediate braces. Gate fabric shall be attached to the gate frame by method standard with the manufacturer except that welding will not be permitted. Latches, hinges, stops, keepers, rollers, and other hardware items shall be furnished as required for the operation of the gate. Latches shall be arranged for padlocking so that the padlock will be accessible from both sides of the gate. Stops shall be provided for holding the gates in the open position.

2.1.1.3 Posts

FS RR-F-191/3, zinc-coated; Class 1 Grade A or B, steel pipe; Class 3, formed steel sections; or Class 6, steel square sections. Sizes shall be as shown on the drawings. Line posts and terminal (corner, gate, and pull) posts selected shall be of the same class throughout the fence. Gate post shall be either round or square, subject to the limitation specified in FS RR-F-191/3.

2.1.1.4 Braces and Rails

FS RR-F-191/3, zinc-coated, Class 1, Grade A or B, steel pipe, size SP1. Class 3, formed steel sections, size FS1, conforming to FS RR-F-191/3, may be used as braces if Class 3 line posts are furnished.

2.1.1.5 Accessories

FS RR-F-191/4. Ferrous accessories shall be zinc or aluminum coated. Truss rods shall be furnished for each terminal post. Truss rods shall be provided with turnbuckles or other equivalent provisions for adjustment. Barbed wire shall be zinc or aluminum coated, 4 point barbed type, steel wire. Barbed wire support arms shall be the single V arm type and of the design required for the post furnished. Tie wire for attaching fabric to rails, braces, and posts shall be 9-gauge steel wire.

2.1.2 Concrete

ASTM C 94, using 3/4-inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Grout shall consist of one part portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

2.1.3 Padlocks

ASTM F 883, Type PO1, Grade 2, Size 1-3/4 inch. Padlocks shall be keyed alike and each lock shall be furnished with two keys.

PART 3 EXECUTION

3.1 GENERAL

Fence shall be installed to the lines and grades indicated. The area on either side of the fence line shall be cleared to the extent indicated. Line posts shall be spaced equidistant at intervals not exceeding 10 feet. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Fabric shall be continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Damage to the galvanized surface due to welding shall be repaired with "repair sticks" of zinc-cadmium alloys or zinc-tin-lead alloys per AWS WZC.

3.2 EXCAVATION

Post holes shall be cleared of loose material. Waste material shall be spread where directed. The ground surface irregularities along the fence

line shall be eliminated to the extent necessary to maintain a 2-inch clearance between the bottom of the fabric and finish grade.

3.3 POSTS

Posts shall be set plumb and in alignment. Posts shall be set in concrete to the depth indicated on the drawings. Posts set in concrete shall be set in holes not less than the diameter shown on the drawings. Concrete and grout shall be thoroughly consolidated around each post, shall be free of voids and finished to form a dome. Concrete and grout shall be allowed to cure for 72 hours prior to attachment of any item to the posts. Fence post rigidity shall be tested by applying a 50 pound force on the post, perpendicular to the fabric, at 5 feet above the ground. Post movement measured at the point where the force is applied shall be less than or equal to 3/4 inch from the relaxed position. Every tenth post shall be tested for rigidity. When a post fails this test, further tests on the next four posts on either side of the failed post shall be made. All failed posts shall be removed, replaced and retested at the Contractor's expense.

3.4 RAILS

3.4.1 Top Rail

Top rail shall be supported at each post to form a continuous brace between terminal posts. Where required, sections of top rail shall be joined using sleeves or couplings that will allow expansion or contraction of the rail. Bottom rail, if required for high security fence, shall be installed as indicated on the drawings.

3.4.2 Bottom Rail

The bottom rail shall be bolted to double rail ends and double rail ends shall be securely fastened to the posts. Bolts shall be peened to prevent easy removal. Bottom rail shall be installed before chain link fabric.

3.5 BRACES AND TRUSS RODS

Braces and truss rods shall be installed as indicated and in conformance with the standard practice for the fence furnished. Horizontal (compression) braces and diagonal truss (tension) rods shall be installed on fences over 6 feet in height. A center brace or 2 diagonal truss rods shall be installed on 12-foot fences. Braces and truss rods shall extend from terminal posts to line posts. Diagonal braces shall form an angle of approximately 40 to 50 degrees with the horizontal. No bracing is required on fences 6 feet high or less if a top rail is installed.

3.6 TENSION WIRES

Tension wires shall be installed along the top and bottom of the fence line and attached to the terminal posts of each stretch of the fence. Top tension wires shall be installed within the top 1 foot of the installed fabric. Bottom tension wire shall be installed within the bottom 6 inches of the installed fabric. Tension wire shall be pulled taut and shall be free of sag.

3.7 CHAIN LINK FABRIC

Chain link fabric shall be installed on the side of the post indicated. Fabric shall be attached to terminal posts with stretcher bars and tension bands. Bands shall be spaced at approximately 15-inch intervals. The fabric shall be installed and pulled taut to provide a smooth and uniform appearance free from

sag, without permanently distorting the fabric diamond or reducing the fabric height. Fabric shall be fastened to line posts at approximately 15-inch intervals and fastened to all rails and tension wires at approximately 24-inch intervals. Fabric shall be cut by untwisting and removing pickets. Splicing shall be accomplished by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be 1 inch (plus or minus 1/2 inch) above the ground.

3.8 BARBED WIRE SUPPORTING ARMS AND BARBED WIRE

Barbed wire supporting arms and barbed wire shall be installed as indicated and as recommended by the manufacturer. Supporting arms shall be anchored to the posts in a manner to prevent easy removal with hand tools. Supporting arms shall be anchored with 3/8 inch diameter plain pin rivets or, at the Contractor's option, with studs driven by low-velocity explosive-actuated tools for steel, wrought iron, ductile iron, or malleable iron. Studs driven by an explosive-actuated tool shall not be used with gray iron or other material that can be fractured. A minimum of two studs per support arm shall be used. Barbed wire shall be pulled taut and attached to the arms with clips or other means that will prevent easy removal.

3.9 GATES

Gates shall be installed at the locations shown. Hinged gates shall be mounted to swing as indicated. Latches, stops, and keepers shall be installed as required. Padlocks shall be attached to gates or gate posts with chains and hinge pins, and hardware shall be welded or otherwise secured to prevent removal.

END OF SECTION 02831

SECTION 02935

TURF

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AGRICULTURAL MARKETING SERVICE (AMS)

AMS-01	(Amended thru: Aug 1988) Federal Seed Act Regulations (Part 201-202)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 977	(1991) Emulsified Asphalt
ASTM D 2028	(1976; R 1992) Cutback Asphalt (Rapid-Curing Type)
ASTM D 2607	(1969) Peats, Mosses, Humus, and Related Products

FEDERAL SPECIFICATION (FS)

FS 0-F-241	(Rev D) Fertilizers, Mixed, Commercial

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Manufacturer's Literature; FIO.

Manufacturer's literature discussing physical characteristics, application and installation instructions for erosion control blanket material, and for pesticide material.

SD-07 Schedules

Equipment List; FIO.

A list of proposed pesticide application, seeding and mulching equipment to be used in performance of turfing operation, including descriptive data and calibration tests.

SD-08 Statements

Delivery; FIO.

Delivery schedule, at least 10 days prior to the intended date of the first delivery.

Application of Pesticide; FIO.

Pesticide treatment plan with proposed sequence of pesticide treatment work. The pesticide trade name, chemical composition, formulation, active ingredient, concentration, application rate of active ingredients and method of application for all materials; and the name and state license number of the state certified applicator shall be included.

SD-13 Certificates

Certificates of Compliance; FIO

Certificates of compliance certifying that materials meet the requirements specified, prior to the delivery of materials. Certified copies of the reports for the following materials shall be included:

Seed; FIO

For mixture, percent pure live seed, minimum percent germination and hard seed, maximum percent weed seed content, date tested and state certification.

Asphalt Adhesive; FIO

For compliance with ASTM D 977 and ASTM D 2028.

Pesticide Material; FIO

For EPA registration number and registered uses.

Topsoil; FIO

For pH, percent organic matter, chemical analysis including calcium, magnesium, potassium and catiom exchange capacity for percent base saturation of the same and mechanical analysis.

1.3 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.3.1 Delivery

1.3.1.1 Topsoil

A soil test shall be provided for topsoil delivered to the site.

1.3.1.2 Pesticide

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the Environmental Protection Agency (EPA) registration number and the manufacturer's registered uses.

1.3.2 Inspection

Seed shall be inspected upon arrival at the job site by the Contracting Officer for conformity to type and quality in accordance with paragraph

MATERIALS. Other materials shall be inspected for meeting specified requirements and unacceptable materials shall be removed from the job site.

1.3.3 Storage

Materials shall be stored in areas designated by the Contracting Officer. Seed, lime and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment materials shall not be stored with other landscape materials.

1.3.4 Handling

1.3.4.1 Materials

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Seed

2.1.1.1 Seed Classification

State-certified seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS-01 and applicable state seed laws.

2.1.1.2 Seed Mixtures

Seed mixtures shall be proportioned by weight as follows:

Seed Mixture	Percentage by Weight
Total pure live grass seed	98
Weed seed (not to exceed 1%)	1.0
Other than weed and pure live seed (maximum)	1.0
	100.00

2.1.1.3 Quality

Weed seed shall not exceed 1 percent by weight of the total mixture. Wet, moldy, or otherwise damaged seed shall be rejected.

2.1.1.4 Seed Mixing

The field mixing of seed shall be performed on site in the presence of the Contracting Officer.

2.1.1.5 Upland Seed Mixture

Botanical Name	Common Name	Lbs./Ac.
Bouteloua Gracillle	Blue Grama	1.000#
Bouchloe Dectyloides	Buffalo Grass	30 to 80#
Avena Sative	Seed Oats	48.000#

TOTAL		WEIGHT VARIES

2.1.1.6 Bottomland Seed Mixture

Botanical Name	Common Name	Lbs./Ac.
Agrostia Alba	Redtop	7.500#
Agrostia Alba Palustria	Creeping Bent	7.500#
Eleocharis Palustira	Spike Rush	0.375#
Festuca Rubra "Dawson"	"Dawson" Creeping Red Fescue	88.000#
Lollum Perenne	Perennial Rye	15.000#
Poa Pratonsis	Kentucky Blue Grass	52.000#
TOTAL LBS. PER ACRE		150.375#

2.1.1.7. Upland and Bottomland

Prior to the above seeding, apply a fast germinating seed mix of seed oats and sheep fescue at a seeding rate of 32 lbs per acre and 3 lbs per 1000 square foot respectively.

2.1.2 Topsoil

Topsoil shall be the existing soil which has been stripped and stockpiled on the site.

2.1.3 Mulch

Mulch shall be free from weeds, mold, and other deleterious materials.

2.1.3.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

2.1.4 Asphalt Adhesive

Asphalt adhesive shall conform to the following:

2.1.4.1 Emulsified Asphalt

Conforming to ASTM D 977, Grade SS-1.

2.1.4.2 Cutback Asphalt

Conforming to ASTM D 2028, designation RC-70.

2.1.5 Water

Water shall not contain elements toxic to plant life and shall be of a quality suitable for irrigation.

2.1.6 Pesticide

The pesticide material shall be EPA registered and approved for the intended use.

PART 3 EXECUTION

3.1 SEEDING TIMES AND CONDITIONS

3.1.1 Seeding Time

Seed shall be sown from 15 April to 15 August for spring/summer planting and from 15 September to 30 November for fall planting.

3.1.2 Turfing Conditions

Turf operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped when directed. When the completion schedule of the contract requires a delay in permanent grassing operations due to the limitation dates specified in para. 3.1.1, the areas not yet seeded or which do not have a vegetative cover, shall be seeded immediately with a temporary cover of seed oats @ rate of 50#/acre. When special conditions warrant a variance to the turf operations, proposed times shall be submitted to and approved by the Contracting Officer.

3.2 SITE PREPARATION

3.2.1 Grading

The Contracting Officer shall verify that finished grades are as indicated on drawings, and the placing of topsoil and the smooth grading has been completed in accordance with Section 02210 GRADING.

3.2.1.1 Unsatisfactory Environmental Conditions

Site preparation work shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture or other unsatisfactory condition prevails, the work shall be stopped when directed.

3.2.2 Application of Soil Amendments

3.2.2.1 Soil Test

A soil test shall be performed for pH, chemical analysis including calcium, magnesium, potassium and catiom exchange capacity for percent base saturation of the same and mechanical analysis to establish the quantities and type of soil amendments required to meet local growing conditions for the type and variety of turf specified.

2.2.3 Deviations

Deviations in the ground surface in relation to the grades indicated shall be corrected prior to grassing.

3.2.4 Topsoil

Topsoil shall be distributed uniformly and spread evenly to an average thickness of 3 inches, with a minimum thickness of 2 inches. Topsoil shall be spread so that planting can proceed with little additional soil preparation or additional tillage. Surface irregularities resulting from topsoiling or other

operations shall be leveled to prevent depressions. Grade shall be adjusted to assure that planted grade will be 1 inch below adjoining grade of any surfaced area. New surfaces shall be blended into existing areas. Soil compacted by construction equipment or soil on compacted cut slopes of grades shall be pulverized to a minimum depth of 2 inches by disking or plowing before applying topsoil.

3.2.5 Tillage

3.2.5.1 Minimum Depth

Soil on slopes gentler than 3-horizontal-to-1-vertical shall be tilled with a spiked "Gill" rig & rolled till form. On slopes between 3-horizontal-to-1-vertical up to 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum depth of 2 inches by scarifying with heavy rakes, or other method. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required.

3.2.6 Finished Grading

3.2.6.1 Preparation

Turf areas shall be filled as needed or have surplus soil removed to attain the finished grade. Drainage patterns shall be maintained as indicated on drawings. Turf areas compacted by construction operations shall be completely pulverized by tillage. Soil used for repair of erosion or grade deficiencies shall conform to topsoil requirements specified in Section 02210 GRADING. Finished grade shall be 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas.

3.2.6.2 Upland Area Debris

Debris and stones larger than 1 inch in any dimension shall be removed from the surface.

3.2.6.3 Bottomland Area Debris

Debris and stones larger than 3 inches in any dimension shall be removed from the surface.

3.2.6.4 Protection

Finished graded areas shall be protected from damage by vehicular or pedestrian traffic and erosion.

3.3 SEEDING

3.3.1 General

Prior to seeding, any previously prepared seedbed areas compacted or damaged by interim rain, traffic or other cause, shall be reworked to restore the ground condition previously specified. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

3.3.2 Equipment Calibration

The equipment to be used and the methods of turfing shall be subject to the inspection and approval of the Contracting Officer prior to commencement of turfing operations. Immediately prior to the commencement of turfing operations, the Contractor shall conduct turfing equipment calibration tests in the presence of the Contracting Officer.

3.3.3 Applying Seed

3.3.3.1 The seed mixture shall be drilled into the prepared area,

3.3.3.2 Drill Seeding

Seed shall be uniformly drilled to an average depth of 1/2 inch using equipment having drills not more than 6-1/2 inches apart. Row markers shall be used with the drill seeder.

3.3.3.3 Seeding Rates

Seed Mixture	Application Rate
Uplands Specified in Para. 2.1.1.5	79 lb/acre
Seed Oats	129 lb/acre
Seed Oats	150.375 lbs/acre

3.3.4 Rolling

Immediately after seeding, except for slopes 3-horizontal-to-1 vertical and greater, the entire area shall be firmed with a roller not exceeding 90 pounds for each foot of roller width. Areas seeded with seed drills equipped with rollers shall not be rolled.

3.3.5 Mulch

3.3.5.1 Straw Mulch

Straw mulch shall be spread uniformly at the rate of 1 ton per acre. Mulch shall be spread by blower-type mulch spreader or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of a steep slope and continued uniformly until the area is covered. The mulch shall not be bunched. All seeded areas shall be mulched on the same day as the seeding.

3.3.5.2 Mechanically Anchoring

Immediately following spreading, the mulch shall be anchored to the soil by a V-type-wheel land packer, a scalloped-disk land packer designed to force mulch into the soil surface, or other suitable equipment.

3.3.5.3 Spreading Asphalt Adhesive Coated Mulch

Straw or hay mulch shall be spread simultaneously with asphalt adhesive at the rate of 2 tons per acre by using power mulch equipment which shall be equipped with suitable asphalt pump and nozzle. The adhesive-coated mulch shall be applied evenly over the surface. Sunlight shall not be completely excluded from penetration to the ground surface.

3.3.6 Water

Watering shall be started within 7 days after completing the seeded area. Water shall be applied at a rate sufficient to ensure moist soil conditions to a minimum depth of 1 inch and as necessary to maintain the viability of newly seeded areas. Run-off and puddling shall be prevented. The Contractor shall supply all pumps, hoses, pipelines, watering trenches and sprinkling

equipment. All areas damaged by the Contractor's watering operations shall be repaired at no cost to the Government.

3.4 EROSION CONTROL

3.4.1 Erosion Control Material

Erosion control material, where required, shall be installed in accordance with manufacturer's instructions. Placement of the erosion control material shall be accomplished without damage to installed material or without deviation to finished grade.

3.4.2 Temporary Turf Cover

3.4.2.1 General

When there are contract delays in the turfing operation or a quick cover is required to prevent erosion, the areas designated for turf shall be seeded with a temporary seed as directed by the Contracting Officer.

3.5 APPLICATION OF PESTICIDE

A state-certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Hydraulic equipment shall be provided for the liquid application of pesticides with a leak-proof tank, positive agitation methods, controlled application pressure and metering gauges. A pesticide plan shall be provided to the Contracting Officer as stated in paragraph SUBMITTALS.

3.6 RESTORATION AND CLEAN UP

3.6.1 Restoration

Existing turf areas, pavements and facilities that have been damaged from the turfing operation shall be restored to original condition at Contractor's expense.

3.6.2 Clean Up

Excess and waste material shall be removed from the planting operation and shall be disposed of off the site. Adjacent paved areas shall be cleaned.

3.7 PROTECTION OF TURFED AREAS

Immediately after turfing, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed by the Contracting Officer.

3.8 TURF ESTABLISHMENT PERIOD

3.8.1 Commencement

The Turf Establishment Period for establishing a healthy stand of turf shall begin on the first day of this work and shall end four months after the last day of turfing operations required by this contract. Written calendar time period shall be furnished to the Contracting Officer for the Turf establishment Period. When there is more than one turf establishment period, describe the boundaries of the turfed area covered for each period.

3.8.2 Satisfactory Stand of Turf

3.8.2.1 Seeded Area

a. Lawn Area: A satisfactory stand of turf from the seeding operation for a lawn area is defined as a minimum of 15 grassplants per sq. foot. Bare spots shall be no larger than 6 inches square. The total bare spots shall not exceed 2 percent of the total seeded area.

3.8.3 Maintenance During Establishment Period

3.8.3.1 General

Maintenance of the turfed areas shall include eradicating weeds, eradicating insects and diseases, protecting embankments and ditches from erosion, maintaining erosion control materials and mulch, protecting turfed areas from traffic, mowing, watering, and post-fertilization. Repair work required because of faulty operations or neglect by the Contractor shall be performed without cost to the Government.

3.8.3.2 Mowing

Areas shall be mowed to a minimum height of 3 inches when the average height of the turf becomes 4 inches. Clippings shall be removed when the amount of cut turf is heavy enough to damage the turfed areas.

3.8.3.3 Watering

Watering shall be at intervals to obtain a moist soil condition to a minimum depth of 1 inch. Frequency of watering and quantity of water shall be adjusted in accordance with the growth of the turf. Run-off, puddling and wilting shall be prevented.

3.8.3.4 Pesticide

Treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

3.8.3.5 Repair

The Contractor shall re-establish as specified herein, eroded, damaged or barren areas. Mulch shall also be repaired or replaced as required.

3.8.3.6 Maintenance Report

A written record shall be furnished to the Contracting Officer of the maintenance work performed.

3.9 FINAL ACCEPTANCE

3.9.1 Preliminary Inspection

Prior to the completion of the Turf Establishment Period, a preliminary inspection shall be held by the Contracting Officer. Time for the inspection shall be established in writing. The acceptability of the turf in accordance with the Turf Establishment Period shall be determined. An unacceptable stand of turf shall be repaired as soon as turfing conditions permit.

3.9.2 Final Inspection

A final inspection shall be held by the Contracting Officer to determine

that deficiencies noted in the preliminary inspection have been corrected. Time for the inspection shall be established in writing. Rejected areas shall be repaired or replanted as directed by the Contracting Officer at no cost to the Government.

END OF SECTION 02935

SECTION 03100

STRUCTURAL CONCRETE FORMWORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 347R	(1988) Guide to Formwork for Concrete

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1982; R 1988) Basic Hardboard

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 578	(1992) Rigid, Cellular Polystyrene Thermal Insulation

DEPARTMENT OF COMMERCE (DOC)

DOC PS 1	(1983) Construction and Industrial Plywood

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Design; FIO

Design analysis and calculations for form design and methodology used in the design.

Concrete Formwork; FIO

Manufacturer's data including literature describing form materials, accessories, and form releasing agents.

SD-04 Drawings

Concrete Formwork; FIO

Drawings showing details of formwork including, dimensions of fiber voids, joints, supports, studding and shoring, and sequence of form and shoring removal.

SD-06 Instructions

Form Releasing Agents; FIO

Manufacturer's recommendation on method and rate of application of form releasing agents.

SD-13 Certificates

Fiber Voids; FIO

Certificates attesting that fiber voids conform to the specified requirements.

SD-14 Samples

Fiber Voids; FIO

One sample unit of fiber voids prior to installation of the voids.

1.3 DESIGN

Formwork shall be designed in accordance with methodology of ACI 347R for anticipated loads, lateral pressures, and stresses. Forms shall be capable of producing a surface which meets the requirements of the class of finish specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete.

1.4 STORAGE AND HANDLING

Fiber voids shall be stored above ground level in a dry location. Fiber voids shall be kept dry until installed and overlaid with concrete.

PART 2 PRODUCTS

2.1 FORM MATERIALS

2.1.1 Forms For Class C Finish

Forms for Class C finished surfaces shall be shiplap lumber; plywood conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II; tempered concrete form hardboard conforming to AHA A135.4; other approved concrete form material; or steel, except that steel lining on wood sheathing shall not be used.

2.1.2 Retain-In-Place Metal Forms

Retain-in-place metal forms for concrete slabs and roofs shall be as specified in Section 05300 STEEL DECKING.

2.1.3 Form Ties

Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that

will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 1/4 inch nor more than 1 inch deep and not more than 1 inch in diameter. Removable tie rods shall be not more than 1-1/2 inches in diameter.

2.1.4 Form Releasing Agents

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

2.1.5 Fiber Voids

Fiber voids shall be the product of a reputable manufacturer regularly engaged in the commercial production of fiber voids. The voids shall be constructed of double faced, corrugated fiberboard. The corrugated fiberboard shall be fabricated of wet strength paper, impregnated with paraffin, and laminated with moisture resistant adhesive, and shall have a board strength of 275 psi. Voids which are impregnated with paraffin after construction, in lieu of being constructed with paraffin impregnated fiberboard, are acceptable. Voids shall be designed to support not less than 1000 psf. To prevent separation during concrete placement fiber voids shall be assembled with steel or plastic banding at 4 feet on center maximum, or by adequate stapling or gluing as recommended by the manufacturer. Fiber voids placed under concrete slabs and that are 8 inches in depth may be heavy duty "waffle box" type, constructed of paraffin impregnated corrugated fiberboard.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Formwork

Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION and conforming to construction tolerance given in TABLE 1. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a nonstaining bond breaker.

3.1.2 Fiber Voids

Voids shall be placed on a smooth firm dry bed of suitable material so as not to be displaced vertically and shall be set tight, with no buckled cartons, in order that horizontal displacement cannot take place. Each section of void shall have its ends sealed by dipping in paraffin, with any additional cutting of voids at the jobsite to be field dipped in the same type of sealer, unless liners and flutes are completely impregnated with paraffin. Prior to placing reinforcement, the entire formed area

for slabs shall be covered with a 4 feet x 8 feet minimum flat sheets of fiber void corrugated fiberboard. Joints shall be sealed with a moisture resistant tape having a minimum width of 3 inches. If voids are destroyed or damaged for any reason and are not capable of supporting the design load, they shall be replaced prior to placing of concrete.

3.2 CHAMFERING

Except as otherwise shown, external corners that will be exposed shall be chamfered, beveled, or rounded by moldings placed in the forms.

3.3 COATING

Forms for Class C finished surfaces may be wet with water in lieu of coating immediately before placing concrete, except that in cold weather with probable freezing temperatures coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.4 REMOVAL OF FORMS

Forms shall be removed in a manner that will prevent injury to the concrete and ensure the complete safety of the structure. Formwork for piers, walls, side of beams and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. In no case will supporting forms or shores be removed before the concrete strength has reached 70 percent of design strengths as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

TABLE 1

TOLERANCES FOR FORMED SURFACES

1. Variations from the plumb:	In any 10 feet of length ----- 1/4 inch
a. In the lines and surfaces of piers, walls and in arises	Maximum for entire length ----- 1 inch
b. For exposed corners, control-joint grooves, and other conspicuous lines	In any 20 feet of length ----- 1/4 inch Maximum for entire length ---- 1/2 inch
2. Variation from the level or from the grades indicated on the drawings:	In any 10 feet of length ----- 1/4 inch In any bay or in any 20 feet of length ---------- 3/8 inch
a. In slab soffits, ceilings, beam soffits, and in arises, measured before removal of supporting shores	Maximum for entire length ---- 3/4 inch
b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines	In any bay or in any 20 feet of length ---------- 1/4 inch Maximum for entire length ---- 1/2 inch
3. Variation of the linear building lines from established position in plan	In any 20 feet ---------- 1/2 inch Maximum ---------- 1 inch
4. Variation of distance between walls, and piers	1/4 inch per 10 feet of distance, but not more than 1/2 inch in any one bay, and not more than 1 inch total variation
5. Variation in the sizes and locations of sleeves, floor openings, and wall opening	Minus ---------- 1/4 inch Plus ---------- 1/2 inch
6. Variation in cross-sectional dimensions of beams and in the thickness of slabs and walls	Minus ---------- 1/4 inch Plus ---------- 1/2 inch
7. Footings:	
a. Variation of dimensions in plan	Minus ---------- 1/2 inch Plus ---------- 2 inches when formed or plus 3 inches when placed against unformed excavation

b. Misplacement of eccentricity	2 percent of the footing width in the direction of misplacement but not more than ---------- 2 inches
c. Reduction in thickness	Minus ---------- 5 percent of specified thickness
8. Variation in steps:	Riser ---------- 1/8 inch
a. In a flight of stairs	Tread ---------- 1/4 inch
b. In consecutive steps	Riser ---------- 1/16 inch Tread ---------- 1/8 inch

END OF SECTION 03100

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 318/318R	(1989; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185	(1994) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 615	(1994) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4	(1992) Structural Welding Code - Reinforcing Steel

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI MSP-1	(1990) Manual of Standard Practice

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Concrete Reinforcement System; GA

Detail drawings showing reinforcing steel schedules, sizes, grades, and splicing and bending details. Drawings shall show support details including types, sizes and spacing.

SD-08 Statements

Qualifications; FIO

A list of names of qualified welders.

SD-13 Certificates

Reinforcing Steel; FIO

Certified copies of mill reports attesting that the reinforcing steel furnished meets the requirements specified, prior to the installation of reinforcing steel.

1.3 QUALIFICATIONS

Welders shall be qualified in accordance with AWS D1.4. Qualification test shall be performed at the worksite and the Contractor shall notify the Contracting Officer 24 hours prior to conducting tests. Special welding procedures and welders qualified by others may be accepted as permitted by AWS D1.4.

1.4 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

PART 2 PRODUCTS

2.1 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615 or grade 60, and sizes as indicated.

2.2 WELDED WIRE FABRIC

Welded wire fabric shall conform to ASTM A 185.

2.3 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

2.4 SUPPORTS

Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI MSP-1 and shall be steel or precast concrete blocks. Precast concrete blocks shall have wire ties and shall be not less than 4 by 4 inches when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports within 1/2 inch of concrete surface shall be galvanized, plastic protected or of stainless steel. Concrete supports used in concrete exposed to view shall have the same color and texture as the finish surface. For slabs on grade, supports shall be precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.

PART 3 EXECUTION

3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318/318R. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms.

3.1.1 Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318/318R at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318/318R. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

3.1.2 Splicing

Splices of reinforcement shall conform to ACI 318/318R and shall be made only as required or indicated. Splicing shall be by lapping or by mechanical connection; except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Welding shall conform to AWS D1.4. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth the required length of lap or 6 inches. Mechanical splices shall be in accordance with the recommendation of the manufacturer of the mechanical splicing device. Splices shall develop 125 percent of the specified minimum yield tensile strength of the spliced bars or of the smaller bar in transition splices. Bars shall be flame dried before mechanical splicing. Adequate jigs and clamps or other devices shall be provided to support, align, and hold the longitudinal centerline of the bars to be mechanical spliced in a straight line.

3.2 WELDED-WIRE FABRIC

Welded-wire fabric shall be placed in slabs as indicated. Fabric placed in slabs on grade shall be continuous between expansion, construction, and contraction joints. Fabric placement at joints shall be as indicated. Lap splices shall be made in such a way that the overlapped area equals the distance between the outermost crosswires plus 2 inches. Laps shall be staggered to avoid continuous laps in either direction. Fabric shall be wired or clipped together at laps at intervals not to exceed 4 feet. Fabric shall be positioned by the use of supports.

END OF SECTION 03200

SECTION 03250

EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 71-84	(1989) Standard Test Method for Relative Density of Solid Pitch (Cube-In-Water Method)
ASTM D 93-97	Test methods flash point by Pensky-Martens closed tester
ASTM C 920	1987) Elastomeric Joint Sealants
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 5249	(1992) Backer Material for Use With Cold and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Preformed Expansion Joint Filler; FIO

Sealant; FIO

Waterstops; FIO

Manufacturer's literature, including safety data sheets, for preformed fillers and the lubricants used in their installation; field-molded sealants and primers (when required by sealant manufacturer); preformed compression seals; and waterstops.

SD-06 Instructions

Preformed Expansion Joint Filler; FIO

Sealant; FIO

Waterstops; FIO

Manufacturer's recommended instructions for installing preformed fillers, field-molded sealants, and waterstops.

1.3 DELIVERY AND STORAGE

Material delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants. Sealants shall be delivered in the manufacturer's original unopened containers. Sealants whose shelf life has expired shall be removed from the site.

PART 2 PRODUCTS

2.1 PREFORMED EXPANSION JOINT FILLER

Expansion joint filler shall be preformed material conforming to ASTM D 1751. Unless otherwise indicated, filler material shall be 1/2 inch thick and of a width applicable for the joint formed. Backer material, when required, shall conform to ASTM D 5249.

2.2 SEALANTS

2.2.1 Field Molded Type

ASTM C 920, Type M for horizontal joints or Type NS for vertical joints, Class 25, and Use NT. Bond breaker material shall be polyethylene tape, coated paper, metal foil or similar type materials. The back-up material shall be compressible, non-shrink, non-reactive with sealant, and non-absorptive material type such as extruded butyl or polychloroprene rubber.

2.3 WATERSTOPS

2.3.1 Non-Metallic Hydrophilic

Swellable strip type compound of sodium bentonite/butyl rubber-based waterstop that swells upon contact with water. Conform to ASTM D 71-84 specific gravity of 1.57. Flash point at 365 degF. ASTM D93-97.

PART 3 EXECUTION

3.1 JOINTS

Joints shall be installed at locations indicated and as authorized.

3.1.1 Contraction Joints

3.1.1.1 Sawed Joints

Joint sawing shall be early enough to prevent uncontrolled cracking in the slab, but late enough that this can be accomplished without appreciable spalling. Concrete sawing machines shall be adequate in number and power, and with sufficient replacement blades to complete the sawing at the required rate. Joints shall be cut to true alignment and shall be cut in sequence of concrete placement. Sludge and cutting debris shall be removed.

3.1.2 Expansion Joints

Preformed expansion joint filler shall be used in expansion and isolation joints in slabs around columns and between slabs on grade and vertical surfaces where indicated. The filler shall extend the full slab depth, unless otherwise indicated. The edges of the joint shall be neatly finished with an edging tool of 1/8 inch radius, except where a resilient floor surface will be applied. Where the joint is to receive a sealant, the filler strips shall be installed at the proper level below the finished floor with a slightly tapered, dressed and oiled wood strip temporarily secured to the top thereof to form a recess to the size shown on the drawings. The wood strip shall be removed after the concrete has set. Contractor may opt to use a removable expansion filler cap designed and fabricated for this purpose in lieu of the wood strip. The groove shall be thoroughly cleaned of laitance, curing compound, foreign materials, protrusions of hardened concrete, and any dust which shall be blown out of the groove with oil-free compressed air.

3.1.3 Joint Sealant

Sawed contraction joints and expansion joints in slabs shall be filled with joint sealant, unless otherwise shown. Joint surfaces shall be clean, dry, and free of oil or other foreign material which would adversely affect the bond between sealant and concrete. Joint sealant shall be applied as recommended by the manufacturer of the sealant.

3.2 WATERSTOPS, INSTALLATION

Waterstops shall be installed at the locations shown to form a continuous water-tight diaphragm. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. Any waterstop damaged shall be repaired or replaced.

3.2.1 Non-Metallic Hydrophilic Waterstop Installation

Surface Preparation: Surfaces should be clean and dry. Remove all dirt, rocks, rust or other debris. Do not install waterstop in standing water.

Apply adhesive a minimum of 5 mils thick, by the width of waterstop over the entire surface to receive waterstop.

After allowing adhesive to dry, remove release paper then firmly press the entire length of waterstop onto the dried adhesive or as prescribed by manufacturer. Press firmly in place.

Tightly butt coil ends together to form continuous waterstop. (Do not overlap coil ends.) Place in maximum practicable lengths to minimize coil end joints. Where required, cut coils with sharp knife or utility blade to fit coil ends together.

3.3 CONSTRUCTION JOINTS

Construction joints are specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION except that construction joints coinciding with expansion and contraction joints shall be treated as expansion or contraction joints as applicable.

END OF SECTION 03250

SECTION 03300

CONCRETE FOR BUILDING CONSTRUCTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117	(1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 212.2	(1991) Standard Practice for Selecting Proportions for Structural Lightweight Concrete
ACI 301	(1989) Structural Concrete for Buildings
ACI 305R	(1991) Hot Weather Concreting
ACI 318	(1989; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31	(1991) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1990) Concrete Aggregates
ASTM C 39	(1986) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42	(1990) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 78	(1984) Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading)
ASTM C 94	(1992) Ready-Mixed Concrete
ASTM C 109	(1992) Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)

ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 150	(1992) Portland Cement
ASTM C 171	(1992) Sheet Materials for Curing Concrete
ASTM C 172	(1990) Sampling Freshly Mixed Concrete
ASTM C 173	(1978) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 192	(1990a) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1991b) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(1986) Air-Entraining Admixtures for Concrete
ASTM C 309	(1991) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 330	(1990) Lightweight Aggregates for Structural Concrete
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 567	(1991) Unit Weight of Structural Lightweight Concrete
ASTM C 597	(1983; R 1991) Pulse Velocity Through Concrete
ASTM C 803	(1990) Penetration Resistance of Hardened Concrete
ASTM C 805	(1985) Rebound Number of Hardened Concrete
ASTM C 1017	(1992) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1107	(1991a) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM D 98	(1987) Calcium Chloride
ASTM E 96	(1993) Water Vapor Transmission of Materials

FEDERAL SPECIFICATIONS (FS)

FS CCC-C-467	(Rev C) Cloth, Burlap, Jute (or Kenaf)

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100	(1990) Concrete Plant Standards
NRMCA QC 3	(1984) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready-Mixed Concrete Production Facilities
NRMCA TMMB	(1989) Truck Mixer, and Agitator Standards

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-08 Statements

Proportions of Mix; GA.

The results of trial mix along with a statement giving the maximum nominal coarse aggregate size and the proportions of all ingredients that will be used in the manufacture of each strength of concrete, at least 14 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an independent commercial testing laboratory, attesting that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the work without additional tests to show that the quality of the concrete is satisfactory.

SD-09 Reports

Sampling and Testing; FIO.

Certified copies of laboratory test reports, including all test data, for aggregate, admixtures, and curing compound. These tests shall be made by an approved commercial laboratory or by a laboratory maintained by the manufacturers of the materials.

SD-13 Certificates

Cementitious Materials; FIO.

Manufacturer's certification of compliance, accompanied by mill test reports attesting that the materials meet the requirements of the specification under which it is furnished, for cement, pozzolan, and ground iron blast-furnace slag. No cement, pozzolan, or slag shall be used until notice of acceptance has been given. Cement, pozzolan, and slag may be subjected to check testing by the Government from samples obtained at the mill, at transfer points, or at the project site.

1.3 GENERAL REQUIREMENTS

Tolerances for concrete construction and materials shall be in accordance with ACI 117.

1.3.1 Strength Requirements

Structural concrete for all work shall have a 28-day compressive strength of 4000 pounds per square inch. Concrete made with high early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type I or II portland cement. Lightweight concrete shall have a 28-day compressive strength of 2500 psi.

1.3.2 Air Entrainment

Concrete in structure exposed to the weather shall contain from 5 to 7 percent total air. Other concrete may, at the option of the Contractor, be air entrained to produce concrete with 3 to 5 percent total air.

1.3.3 Special Properties

Concrete may contain other admixtures, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if approved.

1.3.4 Slump

Slump shall be within the following limits:

Structural Element	Slump in inches Minimum	Maximum
Walls, piers and beams	2	4
Foundation walls, substructure walls, footings and slabs	1	3
Any structural concrete approved for placement by pumping	None	6

Where use of superplasticizers are approved to produce flowing concrete these slump requirements do not apply.

1.3.5 Technical Service for Specialized Concrete

The service of a technical representative shall be obtained to oversee proportioning, batching, mixing, placing, consolidating and finishing of specialized structural concrete, such as lightweight or flowing concrete until field controls indicate concrete of specified quality is furnished.

1.4 PROPORTIONS OF MIX

1.4.1 Mixture Proportioning, Normal Weight Concrete

Trial batches shall contain materials proposed to be used in the project. Trial mixtures having proportions, consistencies and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios. Trial mixes shall be proportioned to produce concrete strengths specified. Trial mixtures shall be designed for maximum permitted slump and air content. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio at least three test cylinders or beams for each test age shall be made and cured in accordance with ASTM C 192. They shall be tested at 7 and 28 days in accordance with ASTM C 39. From these test results a curve shall be plotted showing the relationship between water-cement ratio and strength. For each strength of concrete the maximum allowable water-cement ratio shall be that

shown by these curves to produce an average strength as specified in paragraph AVERAGE STRENGTH.

1.4.2 Mixture Proportioning, Lightweight Concrete

Trial batches shall contain materials proposed to be used in the project. Trial mixtures having proportions, consistencies and air content suitable for the work shall be made based on methodology described in ACI 211.2, using at least three different cement contents. Trial mixes shall be proportioned to produce concrete strengths specified. Trial mixtures shall be proportioned for maximum permitted slump and air content. Test specimens and testing shall be as specified for normal weight concrete except that the 28-day compressive strength shall be determined from test cylinders that have been air dried at 50 percent relative humidity for the last 21 days. A curve shall be plotted using these results showing the relationship between cement factor and strength. Normal weight fine aggregate may be substituted for part or all of the lightweight fine aggregate provided the concrete meets the strength and unit weight specified. Air dry unit weight of lightweight concrete shall be 115 pounds per cubic foot as determined in accordance with ASTM C 567.

1.4.3 Average Strength

In meeting the strength requirements specified, the selected mixture proportion shall produce an average compressive strength exceeding the specified strength by the amount indicated below. Where a concrete production facility has test records, a standard deviation shall be established. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths within 1000 psi of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days or at other test age designated for determination of the specified strength.

1.4.3.1 Test Records Exceeding 29

Required average compressive strength used as the basis for selection of concrete proportions shall be the larger of the specified strength plus the standard deviation multiplied by 1.34 or the specified strength plus the standard deviation multiplied by 2.33 minus 500.

1.4.3.2 Test Records Less Than 29

Where a concrete production facility does not have test records meeting the above requirements but does have a record based on 15 to 29 consecutive tests, a standard deviation may be established as the product of the calculated standard deviation and a modification factor from the following table:

No. of tests (1)	Modification factor for standard deviation
less than 15	See Note
15	1.16
20	1.08
25	1.03
30 or more	1.00

(1) Interpolate for intermediate numbers of tests.

When a concrete production facility does not have field strength test records for calculation of standard deviation or the number of tests is less than 15, the required average strength shall be:

a. The specified strength plus 1000 specified strength of less than 3000 psi.

b. The specified strength plus 1200 for specified strengths of 4000 psi.

1.6 STORAGE OF MATERIALS

Cement and pozzolan shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Reinforcing bars and accessories shall be stored above the ground on platforms, skids or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements.

PART 2 PRODUCTS

2.1 ADMIXTURES

Admixtures shall conform to the following:

2.1.1 Accelerating Admixture

ASTM C 494, Type C or E; or calcium chloride conforming to ASTM D 98.

2.1.2 Air-Entraining Admixture

ASTM C 260.

2.1.3 Flowing Concrete Admixture

ASTM C 1017, Type 1 or 2.

2.1.4 Water-Reducing or Retarding Admixture

ASTM C 494, Type A, B, D, F, or G.

2.2 CEMENTITIOUS MATERIALS

Cementitious materials shall each be of one type and from one source when used in concrete which will have surfaces exposed in the finished structure. Cementitious materials shall conform to one of the following:

2.2.1 Cement

ASTM C 150, Type I or II

2.3 AGGREGATES

Aggregates shall conform to the following:

2.3.1 Lightweight Aggregate

ASTM C 330, Size Designation 1/2 inch.

2.3.2 Normal Weight Aggregate

ASTM C 33. Grading requirement for coarse aggregate shall conform to size number 57.

2.4 CURING MATERIALS

2.4.1 Burlap

FS CCC-C-467.

2.4.2 Impervious Sheets

ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

2.4.3 Membrane-Forming Compounds

ASTM C 309, Type 1-D, Class A or B.

2.4.4 Combination Cure and Seal Compound

ASTM C 309, Type 1, Class A

2.5 EMBEDDED ITEMS

Embedded items shall be of the size and type indicated or as needed for the application. Dovetail slots shall be galvanized steel. Inserts for shelf angles and bolt hangers shall be of malleable iron or cast or wrought steel.

2.6 NONSHRINK GROUT

Nonshrink grout shall conform to ASTM C 1107 Grade A and shall be a formulation suitable for the application.

2.7 NONSLIP SURFACING MATERIAL

Nonslip surfacing material shall consist of fifty-five percent, minimum, aluminum oxide or silicon-dioxide abrasive ceramically bonded together to form a homogenous material sufficiently porous to provide a good bond with portland paste; or factory-graded emery material consisting of not less than 45 percent aluminum oxide and 25 percent ferric oxide. The material shall be well graded from particles retained on the No. 30 sieve to particles passing the No. 8 sieve.

2.10 VAPOR BARRIER

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 6 mils or other equivalent material having a vapor permeance rating not exceeding 0.5 perms as determined in accordance with ASTM E 96.

2.11 WATER

Water shall be potable, except that nonpotable water may be used if it produces mortar cubes having 7- and 28-day strengths at least 90 percent of the strength of similar specimens made with water from a municipal supply. The strength comparison shall be made on mortars, identical except for mixing

water, prepared and tested in accordance with ASTM C 109. Water for curing shall not contain any substance injurious to concrete, or which causes staining.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACES

Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Conduit and other similar items shall be in place and clean of any deleterious substance.

3.1.1 Foundations

Earthwork shall be as specified in Section 02221 EXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS. Flowing water shall be diverted without washing over freshly deposited concrete. Semiporous subgrades for foundations and footings shall be damp when concrete is placed. Pervious subgrades shall be sealed by blending impervious material with the top 6 inches of the in-place pervious material or by covering with an impervious membrane.

3.1.3 Vapor Barrier

Unless otherwise indicated, subgrades for slabs in buildings shall be covered with a vapor barrier. Vapor barrier edges shall be lapped at least 4 inches and ends shall be lapped not less than 6 inches. Patches and lapped joints shall be sealed with pressure-sensitive adhesive or tape not less than 2 inches wide and compatible with the membrane.

3.1.4 Preparation of Previously Placed Concrete

Concrete surfaces to which other concrete is to be bonded shall be roughened in an approved manner that will expose sound aggregate uniformly without damaging the concrete. Laitance and loose particles shall be removed. Surfaces shall be moist but without free water when concrete is placed.

3.2 INSTALLATION OF EMBEDDED ITEMS

Embedded items shall be free from oil, loose scale or rust, and paint. Embedded items shall be installed at the locations indicated and required to serve the intended purpose. Voids in sleeves, slots and inserts shall be filled with readily removable material to prevent the entry of concrete.

3.3 BATCHING, MIXING AND TRANSPORTING CONCRETE

Ready-mixed concrete shall be batched, mixed and transported in accordance with ASTM C 94, except as otherwise specified. Truck mixers, agitators, and nonagitating units shall comply with NRMCA TMMB. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Site-mixed concrete shall be mixed in accordance with ACI 301. On-site plant shall conform to the NRMCA CPMB 100.

3.3.1 Admixtures

Admixtures shall be batched within an accuracy of 3 percent. Where two or more admixtures are used in the same batch, they shall be batched separately and must be compatible. Retarding admixture shall be added within one minute after addition of water is complete or in the first

quarter of the required mixing time, whichever is first. Superplasticizing admixtures shall be added at the project site, and the concrete with the admixture shall be mixed 4 to 5 minutes before placing. Concrete that shows evidence of total collapse or segregation caused by the use of admixture shall be removed from the site.

3.3.2 Control of Mixing Water

No water from the truck system or elsewhere shall be added after the initial introduction of mixing water for the batch except when on arrival at the jobsite, the slump of the concrete is less than that specified. Water added to bring the slump within the specified range shall not change the total water in the concrete to a point that the approved water-cement ratio is exceeded. The drum shall be turned an additional 30 revolutions, or more, if necessary, until the added water is uniformly mixed into the concrete. Water shall not be added to the batch at any later time.

3.3.3 Mixing of Lightweight Concrete

The mixing cycle shall be as recommended by the aggregate producer for the batching and mixing as required by the absorptivity of the aggregate. Typically, the mixer is charged with approximately 2/3 of the total mixing water and all of the aggregate. Ingredients are mixed for not less than 30 seconds in a stationary mixer nor less than 10 revolutions at mixing speed in a truck mixer. Cement, air entraining admixture, and the rest of the mixing water are added to obtain the required slump and mixing is continued for 30 revolutions at mixing speed.

3.4 SAMPLING AND TESTING

Sampling and Testing is the responsibility of the Contractor and shall be performed by an approved testing agency.

3.4.1 Aggregates

Aggregates for normal weight concrete shall be sampled and tested in accordance with ASTM C 33. Gradation tests shall be performed on the first day and every other day thereafter during concrete construction.

3.4.2 Sampling of Concrete

Samples of concrete for air, slump, unit weight, and strength tests shall be taken in accordance with ASTM C 172.

3.4.2.1 Air Content

Test for air content shall be performed in accordance with ASTM C 173 or ASTM C 231. A minimum of 1 test per day shall be conducted.

3.4.2.2 Slump

At least 2 slump tests shall be made on randomly selected batches of each mixture of concrete during each day's concrete placement. Tests shall be performed in accordance with ASTM C 143.

3.4.2.3 Unit Weight

Test for unit weight of lightweight concrete shall be performed in accordance with ASTM C 567. Tests shall be conducted on each batch sampled for strength

tests and on random samples taken for each 75 cubic yards of concrete placed. The unit weight of fresh concrete shall not vary more than 2 pounds per cubic foot from the corresponding unit weight of the approved proportions.

3.4.3 Evaluation and Acceptance of Concrete

3.4.3.1 Frequency of Testing

Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 150 cubic yards of concrete, nor less than once for each 5000 square feet of surface area for slabs or walls. If this sampling frequency results in less than 5 strength tests for a given class of concrete, tests shall be made from at least 5 randomly selected trucks or from each truck if fewer than 5 truck loads are used. Field cured specimens for determining form removal time or when a structure may be put in service shall be made in numbers directed to check the adequacy of curing and protection of concrete in the structure. The specimens shall be removed from the molds at the age of 24 hours and shall be cured and protected, insofar as practicable, in the same manner as that given to the portion of the structure the samples represent.

3.4.3.2 Testing Procedures

Cylinders and beams for acceptance tests shall be molded and cured in accordance with ASTM C 31. Cylinders shall be tested in accordance with ASTM C 39 and beams shall be tested in accordance with ASTM C 78. A strength test shall be the average of the strengths of two cylinders or beams made from the same sample of concrete and tested at 28 days or at another specified test age.

3.4.3.3 Evaluation of Results

Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength and no individual strength test result falls below the required strength by more than 500 pounds per square inch.

3.4.4 Investigation of Low-Strength Test Results

When any strength test of standard-cured test cylinder falls below the specified strength requirement by more than 500 pounds per square inch, or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that load-carrying capacity of the structure is not jeopardized. Nondestructive testing in accordance with ASTM C 597, ASTM C 803 or ASTM C 805 may be permitted by the Contracting Officer to determine the relative strengths at various locations in the structure as an aid in evaluating concrete strength in place or for selecting areas to be cored. Such tests, unless properly calibrated and correlated with other test data, shall not be used as a basis for acceptance or rejection. When strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores shall be determined by the Contracting Officer to least impair the strength of the structure. If the concrete in the structure will be dry under service conditions, the cores shall be air dried temperature 60 to 80 degrees F, relative humidity less than 60 percent) for seven days before testing and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be tested after moisture conditioning in

accordance with ASTM C 42. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to or at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. If the core tests are inconclusive or impractical to obtain, or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318. Concrete work evaluated by structural analysis or by results of a load test and found deficient shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies shall be performed, and approved by the Contracting Officer, at the expense of the Contractor.

3.5 CONVEYING CONCRETE

Concrete shall be conveyed from mixer to forms as rapidly as possible and within the time interval specified in paragraph CONCRETE PLACEMENT by methods which will prevent segregation or loss of ingredients.

3.5.1 Chutes

When concrete can be placed directly from a truck mixer or other transporting equipment, chutes attached to this equipment may be used. Separate chutes will not be permitted except when specifically approved.

3.5.2 Buckets

Bucket design shall be such that concrete of the required slump can be readily discharged. Bucket gates shall be essentially grout tight when closed. The bucket shall provide means for positive regulations of the amount and rate of deposit of concrete in each dumping position.

3.5.3 Belt Conveyors

Belt conveyors may be used when approved. Belt conveyors shall be designed for conveying concrete and shall be operated to assure a uniform flow of concrete to the final place of deposit without segregation or loss of mortar. Conveyors shall be provided with positive means for preventing segregation of the concrete at transfer points and point of placement.

3.5.4 Pumps

Concrete may be conveyed by positive displacement pumps when approved. Pump shall be the piston or squeeze pressure type. Pipeline shall be steel pipe or heavy duty flexible hose. Inside diameter of the pipe shall be at least three times the maximum size of the coarse aggregate. Distance to be pumped shall not exceed the limits recommended by the pump manufacturer. Concrete shall be supplied to the pump continuously. When pumping is completed, the concrete remaining in the pipeline shall be ejected without contaminating the concrete in place. After each use, the equipment shall be thoroughly cleaned. Flushing water shall be wasted outside the forms.

3.6 CONCRETE PLACEMENT

Mixed concrete which is transported in truck mixers or agitators or concrete which is truck mixed, shall be discharged within 1-1/2 hours or before the drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates. These limitations may be waived by the Government if the concrete is of such slump after the 1-1/2

hour time or 300 revolution limit has been reached that it can be placed, without the addition of water to the batch. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the truck.

3.6.1 Placing Operation

Concrete shall be handled from mixer to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 8 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 12 inches thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level to avoid excessive shimming or grouting.

3.6.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 4 inches or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 8000 vibrations per minute, and the head diameter and amplitude shall be appropriate for the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a few inches. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then withdrawn slowly. The use of form vibrators must be specifically approved. Vibrators shall not be used to transport concrete within the forms. Slabs 4 inches and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique. Excessive vibration of lightweight concrete resulting in segregation and flotation of coarse aggregate shall be avoided.

3.6.3 Cold Weather Requirements

Special protection measures, approved by the Contracting Officer, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete is to be placed and the temperature of surfaces to receive concrete shall be not less than 40 degrees F. The temperature of the concrete when placed shall be not less than 50 degrees F nor more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, calcium chloride or chemical admixture conforming to ASTM C 494 Type C or E may be used. The amount of calcium chloride shall not exceed 2 percent by weight of the cement, and it shall be batched in solution form. Calcium chloride shall not be used where concrete will be in contact with aluminum

or zinc-coated items, or where sulfate resistant or prestressed concrete is specified.

3.6.4 Warm Weather Requirements

The temperature of the concrete placed during warm weather shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. In no case shall the placing temperature exceed 95 degrees F.

3.6.5 Steel Pan Stairs

Place lightweight concrete fill in steel pan stair treads. Screed, tamp, trowel and provide abrasive finish to lightweight concrete fill.

3.7 CONSTRUCTION JOINTS

Construction joints shall be located as indicated or approved. Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer. Unless otherwise indicated and except for slabs on grade, reinforcing steel shall extend through construction joints. Construction joints in slabs on grade shall be keyed or doweled as shown. Concrete walls or piers shall be in place at least 2 hours, or until the concrete is no longer plastic, before placing concrete for beams, girders, or slabs thereon. In walls having door or window openings, lifts shall terminate at the top and bottom of the opening. Other lifts shall terminate at such levels as to conform to structural requirements or architectural details. Where horizontal construction joints are required, a strip of 1-inch square-edge lumber, bevelled and oiled to facilitate removal, shall be tacked to the inside of the forms at the construction joint. Concrete shall be placed to a point 1 inch above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, and any irregularities in the joint line shall be leveled off with a wood float, and all laitance shall be removed. Prior to placing additional concrete, horizontal construction joints shall be prepared as specified in paragraph PREPARATIONS OF SURFACES.

3.8 FINISHING CONCRETE

3.8.1 Formed Surfaces

3.8.1.1 Repair of Surface Defects

Surface defects shall be repaired within 24 hours after the removal of forms. Honeycombed and other defective areas shall be cut back to solid concrete or to a depth of not less than 1 inch, whichever is greater. Edges shall be cut perpendicular to the surface of the concrete. The prepared areas shall be dampened and brush-coated with neat cement grout. The repair shall be made using mortar consisting of not more than 1 part cement to 2-1/2 parts sand. The mixed mortar shall be allowed to stand to stiffen (approximately 45 minutes), during which time the mortar shall be intermittently remixed without the addition of water. After the mortar has attained the stiffest consistency that will permit placing, the patching mix shall be thoroughly tamped into place by means approved by the Contracting Officer and finished slightly higher than the surrounding surface. Holes left after the removal of form ties shall be cleaned and filled with patching mortar. Holes left by the removal of tie rods shall be reamed and filled by dry-packing. Repaired surfaces shall be cured as required for adjacent surfaces. The temperature of concrete, mortar patching material, and ambient air shall be above

50 degrees F while making repairs and during the curing period. Concrete with defects which affect the strength of the member or with excessive honeycombs will be rejected, or the defects shall be corrected as directed.

3.8.1.4 Class C Finish

Fins shall be removed. Concrete surfaces shall be relatively smooth with a texture imparted by the forms used.

3.8.2 Unformed Surfaces

In cold weather, the air temperature in areas where concrete is being finished shall not be less than 50 degrees F. In hot windy weather when the rate of evaporation of surface moisture, as determined by methodology presented in ACI 305R, may reasonably be expected to exceed 0.2 per square foot per hour; coverings, windbreaks, or fog sprays shall be provided as necessary to prevent premature setting and drying of the surface. The dusting of surfaces with dry materials or the addition of water during finishing will not be permitted. Finished surfaces shall be plane, with no deviation greater than 5/16 inch when tested with a 10-foot straightedge. Floor tolerance measurements shall be made as soon as possible after finishing. When forms or shoring are used the measurements shall be made prior to their removal. Surfaces shall be pitched to drains.

3.8.2.2 Float Finish

Slabs to receive a steel trowel finish and slabs to receive steel trowel/broom finish shall be given a float finish. Screeding shall be followed immediately by darbying or bull floating before bleeding water is present, to bring the surface to a true, even plane. After the concrete has stiffened to permit the operation and the water sheen has disappeared, it shall be wood floated. Concrete that portrays stickiness shall be finished with a magnesium float in lieu of a wood float, and left free of ridges and other projections.

3.8.2.3 Trowel Finish

Slabs shall be given a trowel finish immediately following floating. Surfaces shall be trowelled to produce smooth, dense slabs free from blemishes including trowel marks. In lieu of hand finishing, an approved power finishing machine may be used in accordance with the directions of the machine manufacturer. A final hard steel troweling shall be done by hand.

3.8.2.5 Broom Finish

After floating, slabs on the exterior shall be lightly trowelled, and then broomed with a fiber-bristle brush in a direction transverse to that of the main traffic.

3.8.2.6 Abrasive Finish

After floating, lightweight concrete fill in metal pan stair treads shall be given a nonslip abrasive finish. Abrasive material shall be uniformly sprinkled over the surface at a rate of not less than 1/4 pound per square foot. The surface shall be steel-trowelled to a smooth, even finish of uniform texture. Immediately after curing, the abrasive material shall be exposed by steel brushing, rubbing with an abrasive stone, or sandblasting.

3.9 CURING AND PROTECTION

3.9.1 General

All concrete shall be cured by an approved method for a period of 7 days. Immediately after placement, concrete shall be protected from premature drying extremes in temperatures, rapid temperature change, mechanical injury and injury from rain and flowing water. Air and forms in contact with concrete shall be maintained at a temperature above 50 degrees F for the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. All materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat shall be permitted near or in direct contact with the concrete at any time. Curing shall be accomplished by any of the following methods, or combination thereof, as approved.

3.9.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period. If water or curing materials used stains or discolors concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned. When wooden forms are left in place during curing, they shall be kept wet at all times. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Horizontal surfaces shall be cured by ponding, by covering with a 2-inch minimum thickness of continuously saturated sand, or by covering with waterproof paper, polyethylene sheet, polyethylene-coated burlap or saturated burlap.

3.9.3 Membrane Curing

Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete; except steel-troweled slabs shall receive the combination cure and seal compound (ASTM C 309, Type 1, Class A). The regular curing compound (ASTM c 309, Type 1-D, Class A or B) selected shall be compatible with any subsequent paint specified. Membrane curing compound shall not be used on surfaces that are maintained at curing temperatures with free steam. Curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. Surfaces shall be thoroughly moistened with water and the curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared, with the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the curing period. Compound shall be applied in a one-coat continuous operation by mechanical spraying equipment, at a uniform coverage in accordance with the manufacturer's printed instructions. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. On surfaces permanently exposed to view, the surface shall be shaded from direct rays of the sun for the duration of the curing period. Surfaces coated with curing or cure-and-seal compound shall be kept free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

3.10 SETTING BASE PLATES AND BEARING PLATES

After being properly positioned, column base plates, bearing plates for beams and similar structural members, and machinery and equipment base plates shall be set to the proper line and elevation with damp-pack bedding

mortar, except where nonshrink grout is indicated. The thickness of the mortar or grout shall be approximately 1/24 the width of the plate, but not less than 3/4 inch. Concrete and metal surfaces in contact with grout shall be clean and free of oil and grease, and concrete surfaces in contact with grout shall be damp and free of laitance when grout is placed.

3.10.1 Damp-Pack Bedding Mortar

Damp-pack bedding mortar shall consist of 1 part cement and 2-1/2 parts fine aggregate having water content such that a mass of mortar tightly squeezed in the hand will retain its shape but will crumble when disturbed. The space between the top of the concrete and bottom of the bearing plate or base shall be packed with the bedding mortar by tamping or ramming with a bar or rod until it is completely filled.

3.10.2 Nonshrink Grout

Nonshrink grout shall be mixed and placed in accordance with material manufacturer's written recommendations. Forms of wood or other suitable material shall be used to retain the grout. The grout shall be placed quickly and continuously, completely filling the space without segregation or bleeding of the mix.

3.10.3 Treatment of Exposed Surfaces

For metal-oxidizing nonshrink grout, exposed surfaces shall be cut back 1 inch and immediately covered with a parget coat of mortar consisting of 1 part portland cement and 2-1/2 parts fine aggregate by weight, with sufficient water to make a plastic mixture. The parge coat shall have a smooth finish. For other mortars or grouts, exposed surfaces shall be left untreated. Curing shall comply with paragraph CURING AND PROTECTION.

END OF SECTION 03300

SECTION 04200

MASONRY

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI SP-66	(1988) ACI Detailing Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 82	(1990a) Steel Wire, Plain, for Concrete Reinforcement
ASTM A 153	(1982; R 1987) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 615	(1993) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 55	(1993a) Concrete Building Brick
ASTM C 90	(1993) Load-Bearing Concrete Masonry Units
ASTM C 91	(1993) Masonry Cement
ASTM C 270	(1992a) Mortar for Unit Masonry
ASTM C 476	(1991) Grout for Masonry
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 641	(1982; R 1991) Staining Materials in Lightweight Concrete Aggregates
ASTM C 780	(1991) Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C 1019	(1989a; R 1993) Sampling and Testing Grout

ASTM C 1072 (1993) Measurement of Masonry Flexural Bond Strength

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Concrete Brick; FIO. Concrete Masonry Units; FIO.

Manufacturer's descriptive data.

SD-04 Drawings

Masonry Work; FIO.

Drawings Including plans, elevations, and details of wall reinforcement; details of reinforcing bars at corners and wall intersections; tops, bottoms, and ends of walls; control and expansion joints; and wall openings. Bar splice locations shall be shown. Bent bars shall be identified on a bending diagram and shall be referenced and located on the drawings. Wall dimensions, bar clearances, and wall openings greater than one masonry unit in area shall be shown. No approval will be given to the shop drawings until the Contractor certifies that all openings, including those for mechanical and electrical service, are shown. If, during construction, additional masonry openings are required, the approved shop drawings shall be resubmitted with the additional openings shown along with the proposed changes. Location of these additional openings shall be clearly highlighted. The minimum scale for wall elevations shall be 1/4 inch per foot. Reinforcement bending details shall conform to the requirements of ACI SP-66.

SD-08 Statements

Cold Weather Installation; FIO.

Cold weather construction procedures.

SD-09 Reports

Field Testing of Mortar; FIO. Field Testing of Grout; FIO.

Test reports from an approved independent laboratory. Test reports on a previously tested material shall be certified as the same as that proposed for use in this project.

SD-13 Certificates

Concrete Brick; FIO. Concrete Masonry Units (CMU); FIO. Bar Positioners; FIO. Joint Reinforcement; FIO. Reinforcing Steel Bars

and Rods; FIO. Mortar Admixtures; FIO. Grout Admixtures; FIO.

Certificates of compliance stating that the materials meet the specified requirements.

SD-14 Samples

Concrete Masonry Units (CMU); FIO. Concrete Brick; FIO.

Units shall show the full range of texture.

Bar Positioners; FIO.

Two of each type used.

Joint Reinforcement; FIO.

One piece of each type used, including corner and wall intersection pieces, showing at least two cross wires.

1.4 DELIVERY, HANDLING, AND STORAGE

Materials shall be delivered, handled, stored, and protected to avoid chipping, breakage, and contact with soil or contaminating material.

1.4.1 Masonry Units

Concrete masonry units shall be covered or protected from inclement weather and shall conform to the moisture content as specified in ASTM C 90 when delivered to the jobsite.

1.4.2 Reinforcement, Anchors, and Ties

Steel reinforcing bars, coated anchors, ties, and joint reinforcement shall be stored above the ground. Steel reinforcing bars and uncoated ties shall be free of loose mill scale and rust.

1.4.3 Cementitious Materials, Sand and Aggregates

Cementitious and other packaged materials shall be delivered in unopened containers, plainly marked and labeled with manufacturers' names and brands. Cementitious material shall be stored in dry, weathertight enclosures or be completely covered. Cement shall be handled in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Sand and aggregates shall be stored in a manner to prevent contamination or segregation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

The source of materials which will affect the appearance of the finished work shall not be changed after the work has started except with Contracting Officer's approval.

2.3 CONCRETE BRICK

Concrete brick shall conform to ASTM C 55, Type I, Grade N-I. Concrete brick may be used where necessary for filling out in concrete masonry unit construction.

2.4 CONCRETE MASONRY UNITS (CMU)

Hollow and solid concrete masonry units shall conform to ASTM C 90, Type I, Normal weight. Cement shall have a low alkali content and be of one brand.

2.4.1 Aggregates

Lightweight aggregates and blends of lightweight and heavier aggregates in proportions used in producing the units, shall comply with the following requirements when tested for stain-producing iron compounds in accordance with ASTM C 641: by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light stain" classification.

2.4.2 Kinds and Shapes

Units shall be modular in size and shall include closer, jamb, header, lintel, and bond beam units and special shapes and sizes to complete the work as indicated. Units used in exposed masonry surfaces in any one structure shall have a uniform fine to medium texture and a uniform color.

2.10 MORTAR

Mortar shall be Type M in accordance with the proportion specification of ASTM C 270 except Type M cement-lime mortar proportions shall be 1 part cement, 1/2 part lime and 4-1/2 parts aggregate; when masonry cement ASTM C 91 is used the maximum air content shall be limited to 12 percent and performance equal to cement-lime mortar shall be verified. Evaluation of performance shall be based on ASTM C 780 and ASTM C 1072. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source.

2.10.1 Admixtures

In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C 494, Type C.

2.11 GROUT

Grout shall conform to ASTM C 476. Cement used in grout shall have a low alkali content. Grout slump shall be between 8 and 10 inches. Grout shall be used subject to the limitations of Table III. Proportions shall not be changed and materials with different physical or chemical characteristics shall not be used in grout for the

work unless additional evidence is furnished that the grout meets the specified requirements.

2.11.1 Admixtures

In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C 494, Type C.

2.11.2 Grout Barriers

Grout barriers for vertical cores shall consist of fine mesh wire, fiberglass, or expanded metal.

2.12 BAR POSITIONERS

Steel wire shall be fabricated from steel wire conforming to ASTM A 82 and shall be zinc-coated in accordance with ASTM a 153, Class B-2.

2.12.5 Bar Positioners

Bar positioners, used to prevent displacement of reinforcing bars during the course of construction, shall be factory fabricated from 9 gauge steel wire or equivalent, and coated with a hot-dip galvanized finish. Not more than one wire shall cross the cell.

2.13 JOINT REINFORCEMENT

Joint reinforcement shall be factory fabricated from steel wire conforming to ASTM A 82, welded construction. Wire shall have zinc coating conforming to ASTM A 153, class B-2. All wires shall be a minimum of 9 gauge. Reinforcement shall be ladder type design, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units. Joint reinforcement shall be placed a minimum of 5/8 inch cover from either face. The distance between crosswires shall not exceed 16 inches. Joint reinforcement for straight runs shall be furnished in flat sections not less than 10 feet long. Joint reinforcement shall be provided with factory formed corners and intersections.

2.14 REINFORCING STEEL BARS AND RODS

Reinforcing steel bars and rods shall conform to ASTM A 615, Grade 60.

2.18 FLASHING

Flashing shall be as specified in Section 07600 SHEET METALWORK, GENERAL.

PART 3 EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

3.1.1 Hot Weather Installation

The following precautions shall be taken if masonry is erected when the ambient air temperature is more than 99 degrees F in the shade and the relative humidity is less than 50 percent. All masonry materials shall be shaded from direct sunlight; mortar beds shall be spread no more than 4 feet ahead of masonry; masonry units shall be set within one minute of spreading

mortar; and after erection, masonry shall be protected from direct exposure to wind and sun for 48 hours.

3.1.2 Cold Weather Installation

Before erecting masonry when ambient temperature or mean daily air temperature falls below 40 degrees F, a written statement of proposed cold weather construction procedures shall be submitted for approval. The following precautions shall be taken during all cold weather erection.

3.1.2.1 Preparation

Ice or snow formed on the masonry bed shall be thawed by the application of heat. Heat shall be applied carefully until the top surface of the masonry is dry to the touch. Sections of masonry deemed frozen and damaged shall be removed before continuing construction of those sections.

a. Air Temperature 40 to 32 Degrees F. Sand or mixing water shall be heated to produce mortar temperatures between 40 degrees F and 120 degrees F.

b. Air Temperature 32 to 25 Degrees F. Sand and mixing water shall be heated to produce mortar temperatures between 40 degrees F and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing.

c. Air Temperature 25 to 20 Degrees F. Sand and mixing water shall be heated to provide mortar temperatures between 40 degrees F and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing. Sources of heat shall be used on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 15 mph.

d. Air Temperature minus 20 Degrees F and below. Sand and mixing water shall be heated to provide mortar temperatures between 40 degrees F and 120 degrees F. Enclosure and auxiliary heat shall be provided to maintain air temperature above 32 degrees F. Temperature of units when laid shall not be less than 20 degrees F.

3.1.2.2 Completed Masonry and Masonry Not Being Worked On

a. Mean daily air temperature 40 degrees F to 32 degrees F. Masonry shall be protected from rain or snow for 24 hours by covering with weather-resistive membrane.

b. Mean daily air temperature 32 degrees F to 25 degrees F. Masonry shall be completely covered with weather-resistant membrane for 24 hours.

c. Mean Daily Air Temperature 25 Degrees F to 20 Degrees F. Masonry shall be completely covered with insulating blankets or equally protected for 24 hours.

d. Mean Daily Temperature 20 Degrees F and Below. Masonry temperature shall be maintained above 32 degrees F for 24 hours by enclosure and supplementary heat, by electric heating blankets, infrared heat lamps, or other approved methods.

3.2 LAYING MASONRY UNITS

Masonry units shall be laid in running bond pattern. Each unit shall be adjusted to its final position while mortar is still soft and plastic. Units that have been disturbed after the mortar has stiffened shall be removed, cleaned, and relaid with fresh mortar. Air spaces, cavities, chases and spaces to be grouted shall be kept free from mortar and other debris. Units used in exposed masonry surfaces shall be free from chipped edges or other imperfections detracting from the appearance of the finished work. Vertical joints shall be kept plumb. Units being laid and surfaces to receive units shall be free of water film and frost. Solid units shall be laid in a nonfurrowed full bed of mortar. Units shall be shoved into place so that the vertical joints are tight. Vertical face shells of concrete masonry units shall be completely filled with mortar. Mortar will be permitted to protrude up to 1/2 inch into the space or cells to be grouted. Means shall be provided to prevent mortar from dropping into the space below.

3.2.1 Surface Preparation

Surfaces upon which masonry is placed shall be cleaned of laitance, dust, dirt, oil, organic matter, or other foreign materials and shall be slightly roughened to provide a surface texture with a depth of at least 1/8 inch. Sandblasting shall be used, if necessary, to remove laitance from pores and to expose the aggregate.

3.2.2 Forms and Shores

Forms and shores shall be sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout. Supporting forms and shores shall not be removed in less than 10 days.

3.2.3 Concrete Masonry Units

Units in piers, pilasters, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout shall be full bedded in mortar under both face shells and webs. Other units shall be full bedded under both face shells. Head joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the face shell. Foundation walls below grade shall be grouted solid. Jamb units shall be of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved.

3.2.5 Tolerances

Masonry shall be laid plumb, true to line, with courses level. Bond pattern shall be kept plumb throughout. Corners shall be square unless noted otherwise. Masonry shall be laid within the following tolerances (plus or minus unless otherwise noted):

TABLE II
TOLERANCES

Variation from the plumb in the lines and surfaces of piers, pilasters, walls and arises	
In adjacent masonry units	1/8 inch
In 10 feet	1/4 inch
Variations from the plumb for external corners, and other conspicuous lines	
In 20 feet	1/4 inch
In 40 feet or more	1/2 inch
Variations from the level for exposed lintels, sills, horizontal grooves, and other conspicuous lines	
In 20 feet	1/4 inch
In 40 feet or more	1/2 inch
Variation from level for bed joints and top surfaces of bearing walls	
In 10 feet	1/4 inch
In 40 feet or more	1/2 inch
Variations from horizontal lines	
In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch
Variations in cross sectional dimensions of piers and pilasters and in thickness of walls	
Minus	1/4 inch
Plus	1/2 inch

3.2.6 Cutting and Fitting

Full units of the proper size shall be used wherever possible, in lieu of cut units. Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Wet cut units, before being placed in the work, shall be dried to the same surface-dry appearance as uncut units being laid in the wall. Cut edges shall be clean, true and sharp. Openings in the masonry shall be made carefully so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Reinforced masonry lintels shall be provided above openings over 12

inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

3.2.7 Jointing

Joints shall be tooled when the mortar is thumbprint hard. Horizontal joints shall be tooled last. Joints shall be brushed to remove all loose and excess mortar. Mortar joints shall be finished as follows:

3.2.7.1 Flush Joints

Joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas shall be flush cut. Flush cut joints shall be made by cutting off the mortar flush with the face of the wall. Joints in unparged masonry walls below grade shall be pointed tight.

3.2.7.2 Tooled Joints

Joints in exposed exterior and interior masonry surfaces shall be tooled slightly concave. Joints shall be tooled with a jointer slightly larger than the joint width so that complete contact is made along the edges of the unit. Tooling shall be performed so that the mortar is compressed and the joint surface is sealed. Jointer of sufficient length shall be used to obtain a straight and true mortar joint.

3.2.7.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch. On the exterior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch.

3.2.8 Joint Widths

Joint widths shall be as follows:

3.2.8.1 Concrete Masonry Units

Concrete masonry units shall have 3/8 inch joints.

3.2.9 Embedded Items

Spaces around built-in items shall be filled with mortar. Openings around flush-mount electrical outlet boxes in wet locations shall be pointed with mortar. Anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in shall be embedded as the masonry work progresses. Anchors, ties and joint reinforcement shall be fully embedded in the mortar. Cells receiving anchor bolts and cells of the first course below bearing plates shall be filled with grout.

3.2.10 Unfinished Work

Unfinished work shall be stepped back for joining with new work. Toothing may be resorted to only when specifically approved. Loose mortar shall be removed and the exposed joints shall be thoroughly cleaned before laying new work.

3.2.11 Masonry Wall Intersections

Each course shall be masonry bonded at corners and elsewhere as shown.

Masonry walls shall be anchored or tied together at corners and intersections with bond beam reinforcement and prefabricated corner or tee pieces of joint reinforcement as shown.

3.2.12 Partitions

Partitions shall be continuous from floor to underside of floor or roof deck where shown. Interior partitions thick shall be tied together with joint reinforcement. Partitions containing joint reinforcement shall be provided with prefabricated pieces at corners and intersections or partitions.

3.9 MORTAR

Mortar shall be mixed in a mechanically operated mortar mixer for at least 3 minutes, but not more than 5 minutes. Measurement of ingredients for mortar shall be by volume. Ingredients not in containers, such as sand, shall be accurately measured by the use of measuring boxes. Water shall be mixed with the dry ingredients in sufficient amount to provide a workable mixture which will adhere to the vertical surfaces of masonry units. Mortar that has stiffened because of loss of water through evaporation shall be retempered by adding water to restore the proper consistency and workability. Mortar that has reached its initial set or that has not been used within 2-1/2 hours after mixing shall be discarded.

3.10 REINFORCING STEEL

Reinforcement shall be cleaned of loose, flaky rust, scale, grease, mortar, grout, or other coating which might destroy or reduce its bond prior to placing grout. Bars with kinks or bends not shown on the drawings shall not be used. Reinforcement shall be placed prior to grouting. Unless otherwise indicated, vertical wall reinforcement shall extend to within 2 inches of tops of walls.

3.10.1 Positioning Bars

Vertical bars shall be accurately placed within the cells at the positions indicated on the drawings. A minimum clearance of 1/2 inch shall be maintained between the bars and masonry units. Minimum clearance between parallel bars shall be one diameter of the reinforcement. Vertical reinforcing may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement. Pier and pilaster ties shall be wired in position around the vertical steel. Ties shall be in contact with the vertical reinforcement and shall not be placed in horizontal bed joints.

3.10.2 Splices

Bars shall be lapped a minimum of 48 diameters of the reinforcement. Welded or mechanical connections shall develop at least 125 percent of the specified yield strength of the reinforcement.

3.11 JOINT REINFORCEMENT

Joint reinforcement shall be installed at 16 inches on center or as indicated. Reinforcement shall be lapped not less than 6 inches. Prefabricated sections shall be installed at corners and wall intersections. The longitudinal wires of joint reinforcement shall be placed to provide not less than 5/8 inch cover to either face of the unit.

3.12 PLACING GROUT

Cells containing reinforcing bars shall be filled with grout. Voids at door and window jambs, and other indicated spaces shall be filled solid with grout. Cells under lintel bearings on each side of openings shall be filled solid with grout for full height of openings. Walls below grade, lintels, and bond beams shall be filled solid with grout. Units other than open end units may require grouting each course to preclude voids in the units. Grout not in place within 1-1/2 hours after water is first added to the batch shall be discarded. Sufficient time shall be allowed between grout lifts to preclude displacement or cracking of face shells of masonry units. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, the wall shall be torn down and rebuilt.

3.12.1 Vertical Grout Barriers for Fully Grouted Walls

Grout barriers shall be provided not more than 30 feet apart, or as required, to limit the horizontal flow of grout for each pour.

3.12.2 Horizontal Grout Barriers

Grout barriers shall be embedded in mortar below cells of hollow units receiving grout.

3.12.3 Grout Holes and Cleanouts

3.12.3.1 Grout Holes

Grouting holes shall be provided in slabs, spandrel beams, and other in-place overhead construction. Holes shall be located over vertical reinforcing bars or as required to facilitate grout fill in bond beams. Additional openings spaced not more than 16 inches on centers shall be provided where grouting of all hollow unit masonry is indicated. Openings shall not be less than 4 inches in diameter or 3 by 4 inches in horizontal dimensions. Upon completion of grouting operations, grout holes shall be plugged and finished to match surrounding surfaces.

3.12.3.2 Cleanouts for Hollow Unit Masonry Construction

Cleanout holes shall be provided at the bottom of every pour in cores containing vertical reinforcement when the height of the grout pour exceeds 5 feet. Where all cells are to be grouted, cleanout courses shall be constructed using bond beam units in an inverted position to permit cleaning of all cells. Cleanout holes shall be provided at a maximum spacing of 32 inches where all cells are to be filled with grout. A new series of cleanouts shall be established if grouting operations are stopped for more than 4 hours. Cleanouts shall not be less than 3 by 4 inch openings cut from one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Cleanout holes shall not be closed until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, cleanout holes shall be closed in an approved manner to match surrounding masonry.

3.12.4 Grouting Equipment

3.12.4.1 Grout Pumps

Pumping through aluminum tubes will not be permitted. Pumps shall be operated to produce a continuous stream of grout without air pockets, segregation, or contamination. Upon completion of each day's pumping,

waste materials and debris shall be removed from the equipment, and disposed of outside the masonry.

3.12.4.2 Vibrators

Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout. At least one spare vibrator shall be maintained at the site at all times. Vibrators shall be applied at uniformly spaced points not further apart than the visible effectiveness of the machine. Duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing segregation.

3.12.5 Grout Placement

Masonry shall be laid to the top of a pour before placing grout. Grout shall not be placed in hollow unit masonry until mortar joints have set for at least 24 hours. Grout shall be placed using a hand bucket, concrete hopper, or grout pump to completely fill the grout spaces without segregation of the aggregates. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. The height of grout pours and type of grout used shall be limited by the dimensions of grout spaces as indicated in Table III. Low-lift grout methods may be used on pours up to and including 5 feet in height. High-lift grout methods shall be used on pours exceeding 5 feet in height.

3.12.5.1 Low-Lift Method

Grout shall be placed at a rate that will not cause displacement of the masonry due to hydrostatic pressure of the grout. Mortar protruding more than 1/2 inch into the grout space shall be removed before beginning the grouting operation. Grout pours 12 inches or less in height shall be consolidated by mechanical vibration or by puddling. Grout pours over 12 inches in height shall be consolidated by mechanical vibration and reconsolidated by mechanical vibration after initial water loss and settlement has occurred. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. Low-lift grout shall be used subject to the limitations of Table III.

3.12.5.2 High-Lift Method

Mortar droppings shall be cleaned from the bottom of the grout space and from reinforcing steel. Mortar protruding more than 1/4 inch into the grout space shall be removed by dislodging the projections with a rod or stick as the work progresses. Reinforcing, bolts, and embedded connections shall be rigidly held in position before grouting is started. CMU units shall not be pre-wetted. Grout, from the mixer to the point of deposit in the grout space shall be placed as rapidly as practical by pumping and placing methods which will prevent segregation of the mix and cause a minimum of grout splatter on reinforcing and masonry surfaces not being immediately encased in the grout lift. The individual lifts of grout shall be limited to 4 feet in height. The first lift of grout shall be placed to a uniform height within the pour section and vibrated thoroughly to fill all voids. This first vibration shall follow immediately behind the pouring of the grout using an approved mechanical vibrator. After a waiting period sufficient to permit the grout to become plastic, but before it has taken any set, the succeeding lift shall be poured and vibrated 12 to 18 inches into the preceding lift. If the placing of the succeeding lift is going to be delayed beyond the period of workability of the preceding, each lift shall be reconsolidated by reworking with a second vibrator as soon as the grout has taken its settlement shrinkage. The waiting, pouring, and reconsolidation steps shall be repeated until the top of the pour is reached. The top lift shall be reconsolidated after the required

waiting period. The high-lift grouting of any section of wall between vertical grout barriers shall be completed to the top of a pour in one working day unless a new series of cleanout holes is established and the resulting horizontal construction joint cleaned. High-lift grout shall be used subject to the limitations in Table III.

TABLE III

POUR HEIGHT AND TYPE OF GROUT FOR VARIOUS GROUT SPACE DIMENSIONS

Maximum Grout Pour Height (feet) (4)	Grout Type	Grouting Procedure	Minimum Dimensions of the Total Clear Areas Within Grout Spaces and Cells (in.) (1,2) Hollow-unit Masonry
1	Fine	Low Lift	1-1/2 x 2
5	Fine	Low Lift	2 x 3
8	Fine	High Lift	2 x 3
12	Fine	High Lift	2-1/2 x 3
24	Fine	High Lift	3 x 3
1	Coarse	Low Lift	1-1/2 x 3
5	Coarse	Low Lift	2-1/2 x 3
8	Coarse	High Lift	3 x 3
12	Coarse	High Lift	3 x 3
24	Coarse	High Lift	3 x 4

Notes:
(1) The actual grout space or cell dimension must be larger than the sum of the following items:
a) The required minimum dimensions of total clear areas given in the table above;
b) The width of any mortar projections within the space;
c) The horizontal projections of the diameters of the horizontal reinforcing bars within a cross section of the grout space or cell.

(2) The minimum dimensions of the total clear areas shall be made up of one or more open areas, with at least one area being 3/4 inch or greater in width.

(3) Where only cells of hollow masonry units containing reinforcement are grouted, the maximum height of the pour shall not exceed the distance between horizontal bond beams.

3.13 BOND BEAMS

Bond beams shall be filled with grout and reinforced as indicated on the drawings. Grout barriers shall be installed under bond beam units to retain the grout as required. Reinforcement shall be continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated on the drawings. Where splices are required for continuity, reinforcement shall be lapped 48 bar diameters. A minimum clearance of 1/2 inch shall be maintained between reinforcement and interior faces of units.

3.16 SHELF ANGLES

Shelf angles shall be adjusted as required to keep the masonry level and at the proper elevation. Shelf angles shall be galvanized. Shelf angles shall be provided in sections not longer than 10 feet and installed with a 1/4-inch gap between sections. Shelf angles shall be mitered and welded at building corners with each angle not shorter than 4 feet, unless limited by wall configuration.

3.17 LINTELS

3.17.1 Masonry Lintels

Masonry lintels shall be constructed with lintel units filled solid with grout in all courses and reinforced with a minimum of two No. 4 bars in the bottom course unless otherwise indicated on the drawings. Lintel reinforcement shall extend beyond each side of masonry opening 40 bar diameters or 24 inches, whichever is greater. Reinforcing bars shall be supported in place prior to grouting and shall be located 1/2-inch above the bottom inside surface of the lintel unit.

3.17.2 Precast Concrete and Steel Lintels

Precast concrete and steel lintels shall be as shown on the drawings. Lintels shall be set in a full bed of mortar with faces plumb and true. Steel and precast lintels shall have a minimum bearing length of 8 inches unless otherwise indicated on the drawings.

3.18 SILLS

Sills shall be set in a full bed of mortar with faces plumb and true.

3.23 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, mortar and grout daubs or splashings shall be completely removed from masonry-unit surfaces that will be exposed or painted. Before completion of the work, defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Immediately after grout work is completed, scum and stains which have percolated through the masonry work shall be removed using a high pressure stream of water and a stiff bristle brush. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

3.23.1 Concrete Masonry Unit and Concrete Brick Surfaces

Exposed concrete masonry unit and concrete brick surfaces shall be dry-brushed at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

3.24 BEARING PLATES

Bearing plates for beams, joists and similar structural members shall be set to the proper line and elevation with damp-pack bedding mortar, except where non-shrink grout is indicated. Bedding mortar and non-shrink grout shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

3.25 PROTECTION

Facing materials shall be protected against staining. Top of walls shall be covered with nonstaining waterproof covering or membrane when work is not in progress. Covering of the top of the unfinished walls shall continue until the wall is waterproofed with a complete roof or parapet

system. Covering shall extend a minimum of 2 feet down on each side of the wall and shall be held securely in place. Before starting or resuming, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

3.26 TEST REPORTS

3.26.1 Field Testing of Mortar

At least three specimens of mortar shall be taken each day. A layer of mortar 1/2 to 5/8 inch thick shall be spread on the masonry units and allowed to stand for one minute. The specimens shall then be prepared and tested for compressive strength in accordance with ASTM C 780.

3.26.2 Field Testing of Grout

Field sampling and testing of grout shall be in accordance with the applicable provisions of ASTM C 1019. A minimum of three specimens of grout per day shall be sampled and tested. Each specimen shall have a minimum ultimate compressive strength of 2500 psi at 28 days.

END OF SECTION 04200

SECTION 05055

WELDING, STRUCTURAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC-04	(1989) Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT-01	(1992; Supple) Recommended Practice SNT-TC-1A

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(1993) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A3.0	(1994) Standard Welding Terms and Definitions
AWS D1.1	(1994) Structural Welding Code - Steel
AWS Z49.1	(1988) Safety in Welding and Cutting

1.2 DEFINITIONS

Definitions of welding terms shall be in accordance with AWS A3.0.

1.3 GENERAL REQUIREMENTS

The design of welded connections shall conform to AISC-04 unless otherwise indicated or specified. Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Welding shall be as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Welding shall not be started until welding procedures, welders, welding operators, and tackers have been qualified and the submittals approved by the Contracting Officer. Qualification testing shall be performed at or near the work site. Each Contractor performing welding shall maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-08 Statements

Welding Procedure Qualifications; FIO

Welder, Welding Operator, and Tacker Qualification; FIO

Inspector Qualification; FIO

Copies of the welding procedure specifications; the procedure qualification test records; and the welder, welding operator, or tacker qualification test records.

SD-18 Records

Quality Control; FIO

A quality assurance plan and records of tests and inspections.

1.5 WELDING PROCEDURE QUALIFICATIONS

Except for prequalified (per AWS D1.1) and previously qualified procedures, each Contractor performing welding shall record in detail and shall qualify the welding procedure specification for any welding procedure followed in the fabrication of weldments. Qualification of welding procedures shall conform to AWS D1.1 and to the specifications in this section. Copies of the welding procedure specification and the results of the procedure qualification test for each type of welding which requires procedure qualification shall be submitted for approval. Approval of any procedure, however, will not relieve the Contractor of the sole responsibility for producing a finished structure meeting all the requirements of these specifications. This information shall be submitted on the forms in Appendix E of AWS D1.1. Welding procedure specifications shall be individually identified and shall be referenced on the detail drawings and erection drawings, or shall be suitably keyed to the contract drawings. In case of conflict between this specification and AWS D1.1, this specification governs.

1.5.1 Previous Qualifications

Welding procedures previously qualified by test may be accepted for this contract without requalification if the following conditions are met:

a. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

b. The qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered

under this contract.

c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.5.2 Prequalified Procedures

Welding procedures which are considered prequalified as specified in AWS D1.1 will be accepted without further qualification. The Contractor shall submit for approval a listing or an annotated drawing to indicate the joints not prequalified. Procedure qualification shall be required for these joints.

1.5.3 Retests

If welding procedure fails to meet the requirements of AWS D1.1, the procedure specification shall be revised and requalified, or at the Contractor's option, welding procedure may be retested in accordance with AWS D1.1. If the welding procedure is qualified through retesting, all test results, including those of test welds that failed to meet the requirements, shall be submitted with the welding procedure.

1.6 WELDER, WELDING OPERATOR, AND TACKER QUALIFICATION

Each welder, welding operator, and tacker assigned to work on this contract shall be qualified in accordance with the applicable requirements of AWS D1.1 and as specified in this section. Welders, welding operators, and tackers who make acceptable procedure qualification test welds will be considered qualified for the welding procedure used.

1.6.1 Previous Qualifications

At the discretion of the Contracting Officer, welders, welding operators, and tackers qualified by test within the previous 6 months may be accepted for this contract without requalification if all the following conditions are met:

a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted and approved in accordance with the specified requirements for detail drawings.

b. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

c. The previously qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.

d. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.6.2 Certificates

Before assigning any welder, welding operator, or tacker to work under this contract, the Contractor shall submit the names of the welders, welding operators, and tackers to be employed, and certification that each individual is qualified as specified. The certification shall state the type of welding and positions for which the welder, welding operator, or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person certifying the qualification tests. The certification shall be kept on file, and 3 copies shall be furnished. The certification shall be kept current for the duration of the contract.

1.6.3 Renewal of Qualification

Requalification of a welder or welding operator shall be required under any of the following conditions:

a. It has been more than 6 months since the welder or welding operator has used the specific welding process for which he is qualified.

b. There is specific reason to question the welder or welding operator's ability to make welds that meet the requirements of these specifications.

c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract, and a qualification test has not been taken within the past 12 months. Records showing periods of employment, name of employer where welder, or welding operator, was last employed, and the process for which qualified shall be submitted as evidence of conformance.

d. A tacker who passes the qualification test shall be considered eligible to perform tack welding indefinitely in the positions and with the processes for which he is qualified, unless there is some specific reason to question the tacker's ability. In such a case, the tacker shall be required to pass the prescribed tack welding test.

1.7 INSPECTOR QUALIFICATION

Inspection and nondestructive testing personnel shall be qualified in accordance with the requirements of ASNT-01 for Levels I or II in the applicable nondestructive testing method. The inspector may be supported by assistant welding inspectors who are not qualified to ASNT-01, and assistant inspectors may perform specific inspection functions under the supervision of the qualified inspector.

1.8 SYMBOLS

Symbols shall be in accordance with AWS A2.4, unless otherwise indicated.

1.9 SAFETY

Safety precautions during welding shall conform to AWS Z49.1.

PART 2 PRODUCTS

2.1 WELDING EQUIPMENT AND MATERIALS

All welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator performing qualified welding procedures. All welding equipment and materials shall comply with the applicable requirements of AWS D1.1.

PART 3 EXECUTION

3.1 WELDING OPERATIONS

3.1.1 Requirements

Workmanship and techniques for welded construction shall conform to the requirements of AWS D1.1 and AISC-04 When AWS D1.1 and the AISC-04 specification conflict, the requirements of AWS D1.1 shall govern.

3.1.2 Identification

Welds shall be identified in one of the following ways:

a. Written records shall be submitted to indicate the location of welds made by each welder, welding operator, or tacker.

b. Each welder, welding operator, or tacker shall be assigned a number, letter, or symbol to identify welds made by that individual. The Contracting Officer may require welders, welding operators, and tackers to apply their symbol next to the weld by means of rubber stamp, felt-tipped marker with waterproof ink, or other methods that do not cause an indentation in the metal. For seam welds, the identification mark shall be adjacent to the weld at 3 foot intervals. Identification with die stamps or electric etchers shall not be allowed.

3.2 QUALITY CONTROL

Testing shall be done by an approved inspection or testing laboratory or technical consultant, or if approved, the Contractor's inspection and testing personnel may be used instead of the commercial inspection or testing laboratory or technical consultant. The Contractor shall perform visual inspection to determine conformance with paragraph STANDARDS OF ACCEPTANCE. Procedures and techniques for inspection shall be in accordance with applicable requirements of AWS D1.1.

3.3 STANDARDS OF ACCEPTANCE

Dimensional tolerances for welded construction, details of welds, and quality of welds shall be in accordance with the applicable requirements of

AWS D1.1 and the contract drawings. Nondestructive testing shall be by visual inspection. The minimum extent of nondestructive testing shall be random 50 percent of fillet and butt welds and 100% of full penetration groove welds.

3.3.1 Nondestructive Examination

The welding shall be subject to inspection and tests in the mill, shop, and field. Inspection and tests in the mill or shop will not relieve the Contractor of the responsibility to furnish weldments of satisfactory quality. When materials or workmanship do not conform to the specification requirements, the Government reserves the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment.

3.3.2 DESTRUCTIVE TESTS

When metallographic specimens are removed from any part of a structure, the Contractor shall make repairs. The Contractor shall employ qualified welders or welding operators, and shall use the proper joints and welding procedures, including peening or heat treatment if required, to develop the full strength of the members and joints cut and to relieve residual stress.

3.4 GOVERNMENT INSPECTION AND TESTING

In addition to the inspection and tests performed by the Contractor for quality control, the Government will perform inspection and testing for acceptance to the extent determined by the Contracting Officer. The costs of such inspection and testing will be borne by the Contractor if unsatisfactory welds are discovered, or by the Government if the welds are satisfactory. The work may be performed by the Government's own forces or under a separate contract for inspection and testing. The Government reserves the right to perform supplemental nondestructive and destructive tests to determine compliance with paragraph STANDARDS OF ACCEPTANCE.

3.5 CORRECTIONS AND REPAIRS

When inspection or testing indicates defects in the weld joints, the welds shall be repaired using a qualified welder or welding operator as applicable. Corrections shall be in accordance with the requirements of AWS D1.1 and the specifications. Defects shall be repaired in accordance with the approved procedures. Defects discovered between passes shall be repaired before additional weld material is deposited. Wherever a defect is removed and repair by welding is not required, the affected area shall be blended into the surrounding surface to eliminate sharp notches, crevices, or corners. After a defect is thought to have been removed, and before rewelding, the area shall be examined by suitable methods to insure that the defect has been eliminated. Repair welds shall meet the inspection requirements for the original welds. Any indication of a defect shall be regarded as a defect, unless reevaluation by nondestructive methods or by surface conditioning shows that no unacceptable defect is present.

END OF SECTION 05055

SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC-01	(1993) Load & Resistance Factor Design Manual Vol. 1 - Structural Members, Specifications, and Codes
AISC-02	(1993) Load & Resistance Factor Design Manual Vol. II - Connections
AISC S303	(1992) Code of Standard Practice for Steel Buildings and Bridges
AISC S335	(1989) Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36	(1993a) Structural Steel
ASTM A 53	(1993) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 123	(1989) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel products
ASTM A 242	(1993) High-Strength Low-Alloy Structural Steel
ASTM A 307	(1993a) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 500	(1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 514	(1993: Errata) High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
ASTM A 563	(1993) Carbon and Alloy Steel Nuts

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.21.1	(1990) Lock Washers (Inch Series)

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(1993) Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1	(1994) Structural Welding Code - Steel

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 20	(1991) High Zinc-Dust Primer

1.2 GENERAL REQUIREMENTS

Structural steel fabrication and erection shall be performed by an organization experienced in structural steel work of equivalent magnitude. The Contractor shall be responsible for correctness of detailing, fabrication, and for the correct fitting of structural members. Connections, for any part of the structure not shown on the contract drawings, shall be considered simple shear connections and shall be designed and detailed in accordance with pertinent provisions of AISC-01 and AISC-02. Substitution of sections or modification of connection details will not be accepted unless approved by the Contracting Officer. AISC S335 with pertinent provisions of AISC-01 and AISC-02 shall govern the work. Welding shall be in accordance with AWS D1.1.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings

Structural Steel System; GA.

Structural Connections; GA.

Shop and erection details including members (with their connections) not shown on the contract drawings. Welds shall be indicated by standard welding symbols in accordance with AWS A2.4. All shop drawings shall be sealed by a Massachusetts registered/licensed Engineer.

SD-08 Statements

Erection; GA

Erection plan of the structural steel framing required. Erection plan shall conform to the requirements of AISC S303, shall be submitted prior to erection, and shall describe all necessary temporary supports, including the sequence of installation and removal.

SD-13 Certificates

Mill Test Reports; FIO

Certified copies of mill test reports for structural steel, structural bolts, nuts, washers and other related structural steel items.

Welder Qualifications; FIO

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.1.

SD-14 Samples

Carbon Steel Bolts; FIO
Carbon Steel Nuts; FIO Washers; FIO

Random samples of bolts, nuts, and washers as delivered to the job site if requested, taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

1.4 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

2.1.1 Carbon Grade Steel

Carbon grade steel shall conform to ASTM A 36.

2.1.2 Quenched and Tempered Alloy Steel

Tempered alloy steel shall conform to ASTM A 514.

2.2 STRUCTURAL TUBING

Structural tubing shall conform to ASTM A 500, Grade B.

2.3 STEEL PIPE

Steel pipe shall conform to ASTM A 53, Type E, Grade B, Finish Z.

2.4 STEEL HARDWARE

Bolts, nuts and washers shall be ASTM A 325 and shall be hot-dip galvanized to conform to ASTM A-153.

Carbon steel bolts shall be ASTM A 36 and conform to ASTM A 307, Grade A.

Plain washers shall conform to ASTM F 844. Other types, when required, shall conform to ASME B18.21.1.

2.5 GALVANIZING REPAIR PAINT

Paint: High Zinc-Dust content paint for regalvanizing weld areas and repair-painting of galvanized steel, with dry film containing not less than 93 percent zinc by weight and forming to SSPC Paint 20.

PART 3 EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of the AISC S335. Fabrication and assembly shall be done in the shop to the greatest extent possible. Structural steelwork, (primarily exterior stair and airframe support pipe columns), except surfaces of steel to be encased in concrete, surfaces to be field welded, and the airframe, control stand and service rack shall be hot-dipped galvanized in accordance with ASTM A 123.

3.2 ERECTION

Erection of structural steel shall be in accordance with the applicable provisions of the AISC S335.

3.2.1 Connections

Anchor bolts and other connections between the structural steel and foundations shall be provided and shall be properly located and built into connecting work.

3.2.2 Base Plates and Bearing Plates

Column base plates for columns and bearing plates for beams, girders, and similar members shall be provided. Base plates and bearing plates shall be provided with full bearing after the supported members have been plumbed and properly positioned, but prior to placing superimposed loads. Separate setting plates under column base plates will not be permitted. The area under the plate shall be damp-packed solidly with bedding mortar, except where nonshrink grout is indicated on the drawings. Bedding mortar and grout shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

3.2.3 Field Welded Connections

Field welded structural connections shall be completed before load is applied.

3.2.4 Field Touch-Up

After erection, the field bolt heads and nuts, field welds, and any abrasions in the galvanized coating shall be cleaned and coated with paint conforming to SSPC Paint 20.

END OF SECTION 05120

SECTION 05210

STEEL JOISTS

PART 1 GENERAL

1.1 REFERENCE

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

STEEL JOIST INSTITUTE (SJI)

SJI-01	(1992) Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section C-01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings

Steel Joists; GA.

Detail drawings shall include fabrication and erection details, specifications for shop painting, and identification markings of joists. Members and connections for any portion of the structure not shown on the contract drawings shall be designed and stamped by a registered professional engineer and detailed on the shop drawings. Design computations for all Contractor designed members and connections must accompany the shop drawings.

SD-13 Certificates

Steel Joists; FIO.

Certificates stating that the steel joists have been designed and manufactured in accordance with SJI-01. Complete engineering design computations may be submitted in lieu of the certification.

1.3 DESCRIPTION

Steel joists are designated on the drawings in accordance with the standard designations of the Steel Joist Institute. Joists of other standard designations or joists with properties other than those shown may be substituted for the joists designated provided the structural properties are equal to or greater than those of the joists shown and provided all other specified requirements are met.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in undamaged condition and stored off the ground in a well drained location, protected from damage, and easily accessible for inspection and handling.

PART 2 PRODUCTS

2.1 OPEN WEB STEEL JOISTS

Open web steel joists shall conform to SJI-01, K-Series. Joists shall be designed to support the loads given in the standard load tables of SJI-01.

2.2 ACCESSORIES AND FITTINGS

Accessories and fittings, including end supports and bridging, shall be in accordance with the standard specifications under which the members were designed.

2.3 SHOP PAINTING

Joists and accessories shall be shop painted with a rust-inhibiting primer paint. For joists which will be finish painted under Section C-09900 PAINTING, GENERAL, the primer paint shall be limited to a primer which is compatible with the specified finish paint.

PART 3 EXECUTION

3.1 ERECTION

Installation of joists shall be in accordance with the standard specification under which the member was produced. Joists shall be handled in a manner to avoid damage. Damaged joists shall be removed from the site, except when field repair is approved and such repairs are satisfactorily made in accordance with the manufacturer's recommendations. Joists shall be accurately set, and end anchorage shall be in accordance with the standard specification under which the joists were produced. Joist bridging and anchoring shall be secured in place prior to the application of any construction loads. Any temporary loads shall be distributed so that the carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging during construction or in the completed work. Abraded, corroded, and field welded areas shall be cleaned and touched up with the same type of paint used in the shop painting.

3.2 BEARING PLATES

Bearing plates shall be provided with full bearing after the supporting members have been plumbed and properly positioned, but prior to placing superimposed loads. The area under the plate shall be damp-packed solidly with bedding mortar, except where nonshrink grout is indicated on the drawings. Bedding mortar and grout shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

END OF SECTION 05210

SECTION 05300

STEEL DECKING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-673	(1986; Addenda 1989; Errata Nov 30, 1990) Cold-Formed Steel Design Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 446	(1991) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
ASTM A 525	(1991b) General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A 611	(1991) Steel, Sheet, Carbon, Cold-Rolled, Structural Quality
ASTM A 792	(1989) Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

AMERICAN WELDING SOCIETY (AWS)

AWS D1.3	(1989) Structural Welding Code - Sheet Steel

MILITARY SPECIFICATIONS (MS)

MS DOD-P-21035	(Rev A) Paint, High Zinc Dust Content, Galvanizing Repair (Metric)

STEEL DECK INSTITUTE (SDI)

SDI-02	(1987) Diaphragm Design Manual
SDI Pub No 28	(1992) Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings

Deck Units; GA. Accessories; GA.
Attachments; GA. Holes and Openings; GA.

Drawings shall include type, configuration, structural properties, location, and necessary details of deck units, accessories, and supporting members; size and location of holes to be cut and reinforcement to be provided; location and sequence of welded or fastener connections; and the manufacturer's erection instructions.

SD-13 Certificates

Deck Units; FIO. Attachments; FIO.

Manufacturer's certificates attesting that the decking material meets the specified requirements. Manufacturer's certificate attesting that the operators are authorized to use the low-velocity piston tool.

1.3 DELIVERY, STORAGE, AND HANDLING

Deck units shall be delivered to the site in a dry and undamaged condition, stored off the ground with one end elevated, and stored under a weathertight covering permitting good air circulation. Finish of deck units shall be maintained at all times by using touch-up paint whenever necessary to prevent the formation of rust.

PART 2 PRODUCTS

2.1 DECK UNITS

Deck units shall conform to SDI Pub No 28. Panels of maximum possible lengths shall be used to minimize end laps. Fabricate deck units in lengths to span 3 or more supports with flush, telescoped, or nested 2-inch laps at ends, and interlocking, or nested side laps, unless otherwise indicated. Deck with cross-sectional configuration differing from the units indicated may be used, provided that the properties of the proposed units, determined in accordance with AISI SG-673, are equal to or greater than the properties of the units indicated and that the material will fit the space provided without requiring revisions to adjacent materials or systems.

2.1.1 Roof Deck

Steel roof deck shall conform to ASTM A 446, ASTM A 611 or ASTM A 792. Roof deck units shall be fabricated of 0.0295 inch design thickness or thicker steel be zinc-coated in conformance with ASTM A 525, G90 coating class or aluminum-zinc coated in accordance with ASTM A 792 Coating Designation AZ55.

2.1.2 Form Deck

Deck used as a permanent form for concrete shall conform to ASTM A 446 or ASTM A 611. Deck used as a form for concrete shall be fabricated of the steel design thickness required by the design drawings, and shall be zinc-coated in conformance with ASTM A 525, G90 coating class.

2.1.3 Corrugated Wall Panel (Smoke House) and Siding Panels (Control Tower)

Deck used as wall and siding panels shall be corrugated, of not less than 0.0358 inches thick and conform to ASTM A 446, ASTM A 611 or ASTM A-792. Panel shall be of size indicated. Use also for access dor on control tower as detailed.

2.2 TOUCH-UP PAINT

Touch-up paint for zinc-coated units shall be an approved galvanizing repair paint with a high-zinc dust content. Welds shall be touched-up with paint conforming to MS DOD-P-21035. Finish of deck units and accessories shall be maintained by using touch-up paint whenever necessary to prevent the formation of rust.

2.3 ADJUSTING PLATES

Adjusting plates or segments of deck units shall be provided in locations too narrow to accommodate full-size units. As far as practical, the plates shall be the same thickness and configuration as the deck units.

2.4 ACCESSORIES

The manufacturer's standard accessories shall be furnished as necessary to complete the deck installation. Metal accessories shall be of the same material as the deck and have minimum design thickness as follows: welding washers, 0.0598 inch other metal accessories, 0.0358 inch unless otherwise indicated. Accessories shall include but not be limited to welding washers, butt cover plates, and ridge plates.

PART 3 EXECUTION

3.1 ERECTION

Erection of deck and accessories shall be in accordance with SDI Pubs and the approved detail drawings. Damaged deck and accessories including material which is permanently stained or contaminated, with burned holes or deformed shall not be installed. The deck units shall be placed on secure supports, properly adjusted, and aligned at right angles to supports before being permanently secured in place. The deck shall not be filled with concrete, used for storage or as a working platform until the units have been secured in position. Shoring shall be in position before concrete placement begins in form deck. Loads shall be distributed by appropriate means to prevent damage during construction and to the completed assembly. The maximum uniform distributed storage load shall not exceed the design live load. There shall be no loads suspended directly from the steel deck. Wall panel shall be installed and secured as noted.

3.2 ATTACHMENTS

All fasteners shall be installed in accordance with the manufacturer's recommended procedure, except as otherwise specified. The deck units shall be welded with nominal 5/8 inch diameter puddle welds or fastened with screws, powder-actuated fasteners or pneumatically driven fasteners to supports as indicated on the design drawings and in accordance with requirements of SDI Pub No 28. All welding of steel deck shall be in accordance with AWS D1.3 using methods and electrodes as recommended by the manufacturer of the steel deck being used. Welds shall be made only by operators previously qualified by tests prescribed in AWS D1.3 to perform the type of work required. Welding washers may be used at the connections of the deck to supports. Welding washers shall not be used at sidelaps. Holes and similar defects will not be

acceptable. Deck ends shall be lapped 2 inches butted. All partial or segments of deck units shall be attached to structural supports in accordance with Section 2.5 of SDI-02. Powder-actuated fasteners shall be driven with a low-velocity piston tool by an operator authorized by the manufacturer of the piston tool. Pneumatically driven fasteners shall be driven with a low-velocity fastening tool and shall comply with the manufacturer's recommendations.

3.3 HOLES AND OPENINGS

All holes and openings required shall be coordinated with the drawings, specifications, and other trades. Holes and openings shall be drilled or cut, reinforced and framed as indicated on the drawings or described in the specifications and as required for rigidity and load capacity. Holes and openings less than 6 inches across require no reinforcement. Holes and openings 6 to 12 inches across shall be reinforced by 0.0474-inch thick steel sheet at least 12 inches wider and longer than the opening and be fastened to the steel deck at each corner of the sheet and at a maximum of 6 inches on center. Holes and openings larger than 12 inches shall be reinforced by steel angles installed perpendicular to the steel joists and supported by the adjacent steel joists. Steel angles shall be installed perpendicular to the deck ribs and shall be fastened to the angles perpendicular to the steel joists. Openings must not interfere with seismic members such as chords and drag struts.

END OF SECTION 05300

SECTION 05500

MISCELLANEOUS METAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36	(1993a) Structural Steel
ASTM A 53	(1993) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 446	(1993) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
ASTM A 525	(1993) General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A 611	(1991) Steel, Sheet, Carbon, Cold-Rolled, Structural Quality
ASTM A 666	(1991) Austenltic Stainless Steel Sheet, Strip, Plate and Flat Bar
ASTM B 221	(1992a) Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(1994) Structural Welding Code - Steel

FEDERAL SPECIFICATIONS (FS)

FS RR-C-271	(Rev D) Chains and Attachments, Welded and Weldless

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM-01	(1988) Metal Finishes Manual for Architectural and Metal Products

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings

Miscellaneous Metal Items; GA.

Detail drawings indicating material thickness, type, grade, and class; dimensions; and construction details. Drawings shall include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates. Detail drawings for the following items:

1. Burner and igniter shields
2. Floor gratings and frames
3. Floor plate covers and frames/supports
4. Guard rails
5. Handrails
6. Pipe guards
7. Safety chains
8. Steel stairs
9. Window "glazing" panels
10. Aluminum sleeves and steel hanger rods/connections for Owner-provided interior partitions.
11. Burner location sign

SD-14 Samples

Miscellaneous Metal Items; FIO

Samples of the following items: Safety chains, and burner and igniter shields. Samples shall be full size, taken from manufacturer's stock, and shall be complete as required for installation in the structure. Samples may be installed in the work, provided each sample is clearly identified and its location recorded.

1.3 GENERAL REQUIREMENTS

The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123, ASTM A 446, or ASTM A 525, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.4 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

1.5 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp

lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed fastening shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.6 ANCHORAGE

Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

PART 2 PRODUCTS

2.1 ALUMINUM FINISHES

Unless otherwise specified, aluminum items shall have standard mill finish.

2.2 SHOP PAINTING

Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete and airframe steel in the burn pit shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

2.3 PIPE GUARDS

Pipe guards shall be heavy duty steel pipe conforming to ASTM A 53, Type E or S, weight STD, galvanized finish.

2.4 FLOOR GRATINGS AND FRAMES

Steel grating shall be designed in accordance with NAAMM-01 for bar type floor gratings to meet the indicated load requirements. Edges shall be banded with bars 1/4 inch less in height than bearing bars for grating sizes above 3/4 inch. Banding bars shall be flush with the top of bearing grating. Frames shall be of welded steel construction finished to match the grating. Floor gratings and frames shall be galvanized after fabrication.

2.5 FLOOR PLATES

Floor plates shall be 1/4 inch thick, raised thread steel, galvanized.

2.6 HANDRAILS

Handrails shall be designed to resist a concentrated load of 200 pounds in any direction at any point of the top of the rail or 50 pounds per foot applied horizontally to top of the rail and a uniform load of 100 pounds per foot applied vertically at the top of the rail simultaneously, whichever is more severe.

2.6.1 Steel Handrails, Including Carbon Steel Inserts

Steel handrails, including inserts in concrete, shall be steel pipe conforming to ASTM A 53. Steel railings shall be nominal size as indicated. Railings shall be hot-dip galvanized.

a. Fabrication: Joint posts, rail, and corners shall be fabricated by one of the following methods:

   (1) Flush type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8 inch hexagonal recessed-head setscrews.

   (2) Mitered and welded joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight fitting interior sleeve not less than 6 inches long.

b. Removable sections, toe-boards, and brackets shall be provided as indicated.

2.7 MISCELLANEOUS

Miscellaneous plates and shapes for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings, shields and frames, shall be provided to complete the work.

2.8 FLOOR PLATE COVERS

Floor plate covers (at valve pit) shall be of aluminum or galvanized steel of proper thickness and design to support concentrated load of 200 lbs. Unit shall be sized to provide maximum clear opening. The curb shall be equipped with an integral metal cap flashing of the same gauge and metal as the curb, full welded and ground at corners for weathertightness. Covers shall be completely assembled with heavy hinges, compression spring operators to hold covers open at 90 degree angle, positive snap latch with handles on outside. The cover shall be equipped with an automatic hold-open arm complete with handle to permit one hand release.

2.9 SAFETY CHAINS

Safety chains shall be galvanized welded steel, proof coil chain in accordance with FS RR-C-271, Type I, Class 4. Safety chains shall be straight link style, 3/16-inch diameter, minimum 12 links per foot and with bolt type snap hooks on each end. Eye bolts for attachment of chains shall be galvanized 3/8 inch bolt with 3/4 inch eye, anchored as indicated. Two chains shall be furnished for each guarded opening.

2.10 STEEL STAIRS

Steel stairs shall be complete with structural or formed channel stringers, metal pan cement-filled treads, or grating treads and landings as indicated on the drawings and necessary bolts and other fastenings as indicated. Structural steel shall conform to ASTM A 36. Stairs and accessories shall be galvanized. Risers on stairs with metal pan treads shall be deformed to form a sanitary cove to retain the tread concrete. Integral nosings shall have braces extended into the concrete fill. Gratings for treads and landings shall conform to NAAMM-01. Grating treads shall have slip-resistant nosings.

2.11 ALUMINUM SLEEVES

Aluminum sleeves shall be of size shown, fabricated from B 221 aluminum.

2.12 WINDOW "GLAZING" PANELS

Window "glazing" panels shall be formed of ASTM A 525 galvanized metal sheet, not less than 20 gauge, sized to fit in the rabbets of steel window for "forced entry" service.

2.13 HANGER RODS, CONNECTORS FOR WOOD PARTITIONS.

Provide components for Government-provided interior partitions. Components to be hot dip galvanized (G90) after fabrication.

2.14 BURNER LOCATION SIGN

Fabricate of stainless steel plate with No. 4 mirror finish, with air-frame outline and burner locations as shown on attached sh. 05500-7 etched into the surface and etched areas filled with black enamel. Black enamel shall be baked-on for permanent identification.

2.15 EXPANDED METAL PANELS

Expanded metal panels (at ground burner covers) shall be 3.14 lb. steel with G60 galvanized coating per ASTM A 525.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

All items shall be installed at the locations shown and according to the manufacturer's recommendations. Items listed below require additional procedures as specified.

3.2 PIPE GUARDS

Pipe guards shall be set vertically in concrete. The hollow cores of the pipe shall be filled with concrete having a compressive strength of 3000 psi.

3.3 ATTACHMENT OF HANDRAILS

Toeboards and brackets shall be installed where indicated or required per Code or OSHA. Removable sections shall be installed as indicated.

3.3.1 Installation of Steel Handrails and Guardrails

Installation shall be as indicated on the drawings. Rail ends shall be secured by steel pipe flanges anchored by expansion shields and bolts or through-bolted to a back plate or by 1/4 inch lag bolts to solid backing.

3.4 MOUNTING OF SAFETY CHAINS

Safety chains shall be mounted 3 feet 6 inches) and 2 feet above the floor.

3.5 BURNER LOCATION SIGN

Mount in Control Tower with theft-proof fasteners.

END OF SECTION 05500

SECTION 06100

ROUGH CARPENTRY

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN FOREST AND PAPER ASSOCIATION (AFPA)

AFPA-01	(1991; Supple 1993) National Design Specification for Wood Construction
AFPA WCD No. 1	(1988) Manual for Wood Frame Construction

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 307	(1993a) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

AMERICAN WOOD PRESERVERS' ASSOCIATION (AWPA)

AWPA C2	(1993) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes
AWPA C9	(1993) Plywood - Preservative Treatment by Pressure Processes
AWPA P5	(1993) Standards for Waterborne Preservatives

DEPARTMENT OF COMMERCE (DOC)

DOC PS 1	(1983) Construction and Industrial Plywood

FEDERAL SPECIFICATIONS (FS)

FS FF-N-105	(Rev B; Am 3; Int Am 4; Notice 1) Nails, Brads, Staples and Spikes: Wire, Cut and Wrought

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA-01	(1993) Standard Grading Rules for Northeastern Lumber

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB-01	(1994) Standard Grading Rules for Southern Pine Lumber

TRUSS PLATE INSTITUTE (TPI)

TPI 85	(1985; Errata; Supple; Addenda QST-88 (Appx P) Design Specification for Metal Plate Connected Wood Trusses
TPI QST-88	(1988; Appendix P) Quality Standard for Metal Plate Connected Wood Trusses (Addendum to TPI-85)

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB Std 17	(1993) Grading Rules for West Coast Lumber

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA-01	(1991; Supple No. 3) Western Lumber Grading Rules 91

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Structural Wood Members; GA.

Design analysis and calculations of timbers, fabricated wood trusses, and other fabricated structural members showing design criteria used to accomplish the applicable analysis.

SD-04 Drawings

Structural Wood Members; GA. Installation of Framing; GA.

Drawings of structural timbers, fabricated wood trusses, engineered wood joists and rafters, and other fabricated structural members indicating materials, shop fabrication, and field erection details; including methods of fastening.

SD-13 Certificates

Grading and Marking; FIO.

Manufacturer's certificates (audited by an American Lumber Standards

approved agency) attesting that lumber and material not normally grade marked or exempt from being grade marked meet the specified requirements. Certificate of Inspection issued for grade marked material by an American Lumber Standards Committee (ALSC) recognized lumber inspection agency prior to shipment.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the site in undamaged condition, stored off ground in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity.

PART 2 PRODUCTS

2.1 LUMBER AND SHEATHING

2.1.1 Grading and Marking

2.1.1.1 Lumber Products

Solid sawn and finger-jointed lumber shall bear an authorized gradestamp or grademark recongnized by ALSC, or an ALSC recognized certification stamp, mark, or hammerbrand. Surfaces that are to be exposed to view shall not bear grademarks, stamps, or any type of identifying mark. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

2.1.1.2 Fabricated Structural Members

Wood trusses shall be fabricated in accordance with TPI QST-88. Engineered wood joists and rafters shall be fabricated using an approved quality control system to meet specified requirements.

2.1.1.3 Plywood and other Sheathing Products

Materials shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. Except for plywood, bundle marking will be permitted in lieu of marking each individual piece. Surfaces that are to be exposed to view shall not bear grademarks, stamps, or other types of identifying marks.

2.1.2 Sizes

Lumber and material sizes shall conform to requirements of the rules or standards under which produced. Unless otherwise specified, lumber shall be surfaced on four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

2.1.3 Moisture Content

At the time lumber and other materials are delivered and when installed in the work their moisture content shall be as follows:

a. Treated and Untreated Lumber Except Roof Planking:

4 inches or less, nominal thickness, 19 percent maximum.
5 inches or more, nominal thickness, 23 percent maximum in a 3 inch perimeter of the timber cross-section.

b. Roof Planking: 15 percent maximum.

c. Materials Other Than Lumber: In accordance with standard under which product is produced.

2.1.4 Treatment

2.1.4.1 Lumber and Timbers

Lumber and timbers shall be treated in accordance with AWPA C2 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

a. 0.25 pcf intended for above ground use.

b. 0.40 pcf intended for ground contact and fresh water use.

2.1.4.2 Plywood

Plywood shall be treated in accordance with AWPA C9 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

a. 0.25 pcf intended for above ground use.

b. 0.40 pcf intended for ground contact and fresh water use.

2.1.5 Structural Wood Members

Species and grades shall be as listed in AFPA-01. Structural lumber used in fabrication of bolted trusses and other fabricated structural members for engineered uses, shall have allowable design values of 1050 psi in bending; 700 psi in tension parallel to the grain; 300 psi in compression; 60 psi in horizontal shear; and a modulus of elasticity of 1,200,000 psi. Joists, rafters including trussed type, decking, and headers shall have design values computed in accordance with AFPA - 01. Design of members and fastenings shall conform to AITC-01. Other stress graded or dimensioned items such as blocking, carriages, and studs shall be standard or No. 2 grade except that studs may be Stud grade.

2.1.5.1 Trussed Rafters

As an option to standard rafters, trussed rafters may be provided. The design shall be as indicated. Connections shall be made with light-metal plate-connectors. Light-metal-plate-connected wood trusses shall be designed in conformance with TPI 85 and fabricated in conformance with TPI QST-88. When new plate configuration is proposed, load testing of trusses is required and shall conform to Appendix D of TPI 85.

2.1.5.2 Engineered Wood Joists and Rafters

As an option to standard rafters, engineered wood joists and rafters may be provided. Engineered wood rafters shall be Wood I joists manufactured with 3100 F minimum bending, 2.0 MOE laminated veneer lumber flanges and oriented strand board web.

2.1.6 Sheathing

Sheathing shall be plywood, or wood for roof sheathing.

2.1.6.1 Plywood

Plywood shall conform to DOC PS 1, Grade C-D with exterior glue. Sheathing for roof shall have a span rating of 16/0 or greater for supports 16 inches on center and a span rating of 24/0 or greater for supports 24 inches on center.

2.1.6.2 Wood

Species and grade shall be in accordance with TABLE I at the end of this section. Roof sheathing shall be 1-inch thick for supports 16 or 24 inches on center.

2.1.7 Miscellaneous Wood Members

2.1.7.1 Nonstress Graded Members

Members shall include bridging, bracing, and nailing strips. Members shall be in accordance with TABLE I for the species used. Sizes shall be as follows unless otherwise shown:

Member	Size mm(inch)
Bridging	1 by 3 or 1 by 4 for use between members 2 by 12 and smaller; 2 by 4 for use between members larger than 2 by 12.
Bracing	1 by 4.
Nailing strips	1 by 3.

2.1.7.2 Sill Plates

Sill plates shall be standard or number 2 grade.

2.1.7.3 Blocking

Blocking shall be standard or number 2 grade.

2.1.7.4 Rough Bucks and Frames

Rough bucks and frames shall be straight standard or number 2 grade.

2.2 ACCESSORIES AND NAILS

Markings shall identify both the strength grade and the manufacturer. Accessories and nails shall conform to the following:

2.2.1 Anchor Bolts

ASTM A 307, size as indicated, complete with nuts and washers.

2.2.2 Bolts: Lag, Toggle, and Miscellaneous Bolts and Screws

Type, size, and finish best suited for intended use. Finish options include zinc compounds, cadmium, and aluminum paint impregnated finishes.

2.2.3 Clip Angles

Steel, 3/16 inch thick, size best suited for intended use; or zinc-coated steel or iron commercial clips designed for connecting wood members.

2.2.4 Expansion Shields

Type and size best suited for intended use.

2.2.5 Joist Hangers

Steel or iron, zinc-coated, size to fit members where used, sufficient strength to develop the full strength of supported member, complete with any special nails required.

2.2.6 Metal Bridging

Optional to wood bridging; zinc-coated steel, size and design to provide rigidity equivalent to specified wood bridging.

2.2.7 Nails and Staples

FS FF-N-105, size and type best suited for purpose. For sheathing, length of nails shall be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails shall be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails shall be used for nailing through 2 inch thick lumber. Nails used with treated lumber and sheathing shall be galvanized. Nailing shall be in accordance with the recommended nailing schedule contained in AFPA WCD No. 1. Where detailed nailing requirements are not specified, nail size and spacing shall be sufficient to develop an adequate strength for the connection. The connection's strength shall be verified against the nail capacity tables in AFPA-01. Reasonable judgment backed by experience shall ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector shall be used.

2.2.8 Timber Connectors

Unless otherwise specified, timber connectors shall be in accordance with TPI 85 or AITC-01.

PART 3 EXECUTION

3.1 INSTALLATION OF FRAMING

3.1.1 General

Members shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place. Members shall be framed for passage of other trades' items. Members shall be cut, notched, or bored in accordance

with applicable requirements of AFPA-01 for the passage of pipes, wires, or conduits. Rafters, purlins, and joists shall be set with crown edge up. When joists, beams, and girders are placed on masonry or concrete, a wood base plate shall be positioned and leveled with grout. The joist, beam, or girder shall then be placed on the plate. When joists, beams, and girders are set into masonry or concrete, a pocket shall be formed into the wall. The joist, beam, or girder shall then be placed into the pocket and leveled with a steel shim.

3.1.2 Structural Members

Members shall be adequately braced before erection. Members shall be aligned and all connections completed before removal of bracing.

3.1.3 Partition and Wall Framing

Unless otherwise shown, studs shall be spaced 16 inches on centers. Studs hall be doubled at openings. Unless otherwise indicated, headers for openings shall be made of two pieces of stud material set on edge or solid lumber of equivalent size, and corners shall be constructed of not less than three full members. End studs of partitions abutting concrete or masonry shall be anchored thereto with expansion bolts, one near each end of each stud and at intermediate intervals of not more than 4 feet. Plates of partitions resting on concrete floors shall be anchored in place with expansion bolts, one near each end of each piece and at intermediate intervals of not more than 6 feet between bolts. In lieu of expansion bolts, anchoring into concrete may be accomplished with powder-driven threaded studs of suitable type and size and spaced at 3 feet on center. Walls and load bearing partitions shall be provided with double top plates with members lapped at least 2 feet and well spiked together.

3.1.4 Roof Framing or Rafters

Tops of supports or rafters shall form a true plane. Valley, ridge, and hip members shall be of depth equal to cut on rafters where practicable, but in no case less than depth of rafters. Valleys, hips, and ridges shall be straight and true intersections of roof planes. Rafters, except hip and valley rafters, shall be bolted by angles. Rafters shall be toe-nailed to ridge, valley, or hip members with at least three 8-penny nails. Rafters shall be braced to prevent movement until permanent bracing, decking or sheathing is installed. Hip and valley rafters shall be secured to wall plates by clip angles. Openings in roof shall be framed with headers and trimmers. Unless otherwise indicated, headers carrying more than two rafters and trimmers supporting headers carrying more than one rafter shall be double. Hip rafters longer than the available lumber shall be butt jointed and scabbed. Valley rafters longer than the available lumber shall be double, with pieces lapped not less than 4 feet and well spiked together. Trussed rafters shall be installed in accordance with TPI 85. Engineered wood joists shall be installed in accordance with distributor's instructions.

3.2 INSTALLATION OF SHEATHING

3.2.1 Plywood

Sheathing shall be applied with edges 1/8 inch apart at side and end joints, and nailed at supported edges at 6 inches on center and at intermediate supports 12 inches on center. Nailing of edges shall be 3/8 inch from the edges. Roof sheathing shall be applied with long dimension at right angles to supports, end joints made over supports, and end joints staggered.

3.2.2 Wood

Sheathing end joints shall be made over framing members and so alternated that there will be at least two boards between joints on the same support. Each board shall bear on at least three supports. Boards shall be nailed at each support using two nails for boards 6 inches and less in width and three nails for boards more than 6 inches in width. Roof sheathing shall not be installed where roof decking is installed.

3.3 INSTALLATION OF MISCELLANEOUS WOOD MEMBERS

3.3.1 Bridging

Wood bridging shall have ends accurately bevel-cut to afford firm contact and shall be nailed at each end with two nails. Metal bridging shall be installed as recommended by the manufacturer. The lower ends of bridging shall be driven up tight and secured after subflooring or roof sheathing has been laid and partition framing installed.

3.3.2 Bracing

Bracing shall be installed when required by type of sheathing used. Bracing shall be let into the exterior surfaces of the studs at an angle of approximately 45 degrees, shall extend completely over wall plates, and shall be secured at each bearing with two nails.

3.3.3 Blocking

Blocking shall be provided as necessary for application sheathing and other materials or building items. Blocking shall be cut to fit between framing members and rigidly nailed thereto.

3.3.4 Nailers and Nailing Strips

Nailers and nailing strips shall be provided as necessary for the attachment of finish materials. Nailers used in conjunction with roof deck installation shall be installed flush with the roof deck system. Stacked nailers shall be assembled with spikes or nails spaced not more than 18 inches on center and staggered. Beginning and ending nails shall not be more than 6 inches from nailer end. Ends of stacked nailers shall be offset approximately 12 inches in long runs and alternated at corners. Anchors shall extend through the entire thickness of the nailer. Strips shall be run in lengths as long as practicable, butt jointed, cut into wood framing members when necessary, and rigidly secured in place.

3.3.5 Rough Bucks and Frames

Rough bucks shall be set straight, true, and plumb, and secured with anchors near end of each wood member and at intermediate intervals of not more than 3 feet. Anchors for concrete shall be expansion bolts, and anchors for masonry shall be 3/16 by 1-1/4 inch steel straps extending not less than 8 inches into the masonry and turned down 2 inches into the masonry.

3.3.6 Sill Plates

Sill plates shall be set level and square and anchor bolted at not more than 6 feet on centers and not more than 12 inches from end of each piece. A minimum of two anchors shall be used for each piece.

TABLE I. SPECIES AND GRADE

Roof Sheathing

Grading Rules	Species	Const Standard	No. 2 Comm	No. 2 Board Comm	No. 3 Comm
NELMA-01					X
	Eastern White Pine	X			
	Northern Pine	X			
	Eastern Hemlock-Tamarack				X
SPIB-01	Southern Pine		X		
WCLIB Std 17	Douglas Fir-Larch	X			
	Hem-Fir	X			
	Sitka Spruce	X			
	Mountain Hemlock	X			
	Western Cedar	X			
WWPA-01	Douglas Fir-Larch	X			
	Hem-Fir	X			
	Idaho White Pine	X			
	Lodgepole Pine			X	
	Ponderosa Pine			X	
	Sugar Pine			X	
	Englemann Spruce			X	
	Douglas Fir South			X	
	Mountain Hemlock			X	
	Subalpine Fir			X	
	Western Cedar			X	

END OF SECTION 06100

SECTION 06200

FINISH CARPENTRY

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C9	(1990) Plywood - Preservative Treatment by Pressure Processes
AWPA M4	(1991) The Care of Preservative-Treated Wood Products
AWPA P5	(1992) Waterborne Preservatives

FEDERAL SPECIFICATIONS (FS)

FS FF-N-105	(Rev B; Am 3; Int Am 4; Notice 1) Nails, Brads, Staples and Spikes: Wire, Cut and Wrought

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA-01	(1991) Standard Grading Rules for Northeastern Lumber

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB-01	(1991; Supple 1 thru 4) Standard Grading Rules for Southern Pine Lumber

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB Std 17	(1991) Grading Rules For West Coast Lumber

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA-01	(1991; Supple No. 1) Western Lumber Grading Rules 91

WOOD MOULDING AND MILLWORK PRODUCERS ASSOCIATION (WMMPA)

WMMPA WM 6	(1987) Industry Standard for Non-Pressure Treating of Wood Millwork

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings

Finish Carpentry; GA.

Drawings showing fabricated items and special mill and woodwork items. Drawings shall indicate materials and details of construction, methods of fastening, erection, and installation.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the site in undamaged condition, stored off ground in fully covered, well-ventilated areas, and protected from extreme changes in temperature and humidity.

PART 2 PRODUCTS

2.1 WOOD ITEMS AND TRIM

2.1.1 Grading and Marking

Materials shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Except for plywood and lumber, bundle marking will be permitted in lieu of marking each individual piece. Surfaces that are to be architecturally exposed to view shall not bear grademarks, stamps, or other types of identifying marks.

2.1.2 Sizes and Patterns

Lumber sizes and patterns shall conform to rules or standards under which produced. Unless otherwise specified, lumber shall be surfaced on four sides. Sizes and patterns for materials other than lumber shall conform to requirements of the rules or standards under which produced. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

2.1.3 Moisture Content

The maximum moisture content of untreated trim and wood siding shall be 15 percent at the time of delivery to the jobsite and when installed. Moisture content of all other material shall be in accordance with the standard under which the product is produced.

2.1.4 Preservative Treatment

2.1.4.1 Plywood

Plywood shall be treated in accordance with AWPA C9 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

a. 0.25 pcf intended for above ground use.

b. 0.4 pcf intended for ground contact and fresh water use.

2.1.4.2 Exterior Millwork

Exterior millwork within 18-inches of soil, in contact with water or concrete shall be preservative-treated in accordance with WMMPA WM 6. Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWPA M4.

2.1.5 Fascias and Trim

2.1.5.1 Wood

Fascias and trim, including exterior door and window casing, shall be species and grade listed in TABLE I at the end of this section. Sizes shall be as indicated.

2.2 NAILS

Nails shall be the size and type best suited for the purpose and shall conform to FS FF-N-105. Nails shall be hot-dip galvanized or aluminum. Screws for use where nailing is impractical shall be size best suited for purpose.

PART 3 EXECUTION

3.1 GENERAL

3.2 FASCIAS AND EXTERIOR TRIM

Exposed surfaces and square edges shall be machine sanded, caulked, and constructed to exclude water. Joints of built-up items, in addition to nailing, shall be glued as necessary for weather-resistant construction. End joints in built-up members shall be well distributed. Joints in flat work shall be shouldered. Backs of wide-faced miters shall be held together with metal rings and glue. Fascias and other flat members shall be in maximum practicable lengths.

3.3 TRIM

Trim shall be installed straight, plumb, level and with closely fitted joints. Exposed surfaces shall be machine sanded at the mill. Intersections of flatwork shall be shouldered to ease any inherent changes in plane. Window and door trim shall be provided in single lengths. Blind nailing shall be used to the extent practicable, and face nailing shall be set and stopped with a nonstaining putty to match the finish applied. Screws shall be used for attachment metal; setting and stopping of screws shall be of the same quality as required where nails are used.

TABLE I. SPECIES AND GRADE TABLES

Grading Rules	Species	Choice	Clear	C Select	C & Better
NELMA-01	Eastern Cedar	X			
	Eastern Hemlock		X		
	Tamarack				X
	Eastern W. Pine				X
	Northern Pine				X
	Eastern Spruce			X	
	Balsam Fir		X		
SPIB-01	Southern Pine			X	
WCLIB Std 17	Douglas Fir			X	
	Larch				X
	Hemlock Fir				X
	Mountain Hemlock				X
	Sitka Spruce				X
WWPA-01	Douglas Fir		X		
	Larch				X
	Hemlock Fir		X		
	Mountain Hemlock				X
	Western Larch		X		
	Idaho White Pine	X			
	Lodgepole Pine		X		
	Ponderosa Pine		X		
	Sugar Pine		X		
	Englemann Spruce		X		
	Douglas Fir South		X		
	Subalpine Fir		X		

NOTE 1: Western Cedar under WCLIB Std 17 shall be Grade B; and under WWPA-01, Western Cedar shall be Grade A for trim.

NOTE 2: Except as specified in NOTE 3 below, exterior trim shall be any of the species listed above.

NOTE 3: Southern Yellow Pine, Douglas Fir, Larch, Western Larch, and Tamarack shall not be used where painting is required

END OF SECTION 06200

SECTION 07311

ROOFING, STRIP SHINGLES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 226	(1989) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 3018	(1990) Class A Asphalt Shingles Surfaced With Mineral Granules
ASTM D 3161	(1993) Wind-Resistance of Asphalt Shingles (Fan-Induced Method)
ASTM D 3462	(1993a) Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules
ASTM E 108	(1991a) Fire Tests of Roof Coverings

FEDERAL STANDARDS (FED-STD)

FED-STD 595	(Rev B) Colors Used in Government Procurement

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Roofing System; GA

Manufacturer's catalog data, description of underlayment, shingles, fasteners, and flashing. Manufacturer's instructions, annotated or supplemented by the Contractor to indicate configuration and method for installing the underlayment, shingles, and flashing, and for waterproofing of joints where flashings change direction. The number, spacing and orientation of fasteners shall be specified.

SD-14 Samples

Finishes; FIO

Samples of materials and products requiring color or finish selection.

1.3 DELIVERY AND STORAGE OF MATERIALS

Materials shall be delivered in manufacturer's unopened bundles and containers with the manufacturer's brand and name marked clearly thereon.

Shingles shall be stored in accordance with manufacturer's printed instructions. Roll goods shall be stored on end in an upright position. Immediately before laying, roofing felt shall be stored for 24 hours in an area maintained at a temperature not lower than 50 degrees F.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the following requirements:

2.1.1 Metal Drip Edges

Metal drip edges shall be minimum 28 gauge galvanized steel.

2.1.2 Underlayment

Organic felt; ASTM D 226, Type I.

2.1.3 Nails

In accordance with manufacturer's printed instructions.

2.1.4 Shingles

Shingles shall be approximately 12 by 36 inches in dimension and three-tab strip design. Shingles shall have self-sealing adhesive strips and shall meet a wind velocity rating of 60 mph plus or minus 5 percent in accordance with ASTM D 3161. Glass felt shingles shall comply with ASTM D 3018 and ASTM D 3462 Type I, Class A and shall weigh not less than 240 lbs.

2.2 COLOR

Shingle color shall match Cinnamon Brown as manufactured by Bird Roofing.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACES

The construction of any bay or section of roof decking shall be completed before roofing work is started. Roof surfaces shall be smooth, firm, dry, and free from loose boards, large cracks, and projecting ends that might damage the roofing. Projections through roofs shall be properly flashed and secured in position, and projecting nails shall be driven firmly home.

3.2 APPLICATION OF ROOFING

3.2.1 Flashings

Metal flashings shall conform to Section 07600 SHEET METALWORK, GENERAL. Metal flashings shall be provided at the intersections of roofs and adjoining walls and at projections through the deck.

3.2.2 Metal Drip Edges

Metal drip edges shall be provided along the eaves and rakes. The metal drip edge shall be applied directly over the underlayment along the rakes and directly on the wood deck at the eaves. Metal drip edges shall extend

back from the edge of the deck not less than 3 inches and shall be secured with compatible nails spaced not more than 10 inches on center along the inner edge.

3.2.3 Underlayment

Before any shingles are applied, a single layer of asphalt-saturated-felt underlayment shall be applied to the roof deck sheathing. In areas subject to ice damming, two plies of organic felt set in hot asphalt, or an adhered modified bitumen membrane underlayment shall be applied starting from the eaves to a point 24 inches inside the inside wall line.

3.2.4 Shingles

Shingles shall be applied in accordance with the manufacturer's printed instructions as they appear on the bundle wrapping.

END OF SECTION 07311

SECTION 07411 - MANUFACTURED ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Lap-seam roof panels.
2. Standing-seam roof panels.
3. Batten-seam roof panels.
4. Factory-assembled, insulated roof panels.
5. Formed roof panels of type and profile indicated.

B. Related Sections include the following:

1. Division 5 Section "Structural Steel" for structural-steel framing.
2. Division 5 Section "Steel Deck" for steel roof deck.
3. Division 5 Section "Cold-Formed Metal Framing" for metal framing.
4. Division 6 Section "Rough Carpentry" for wood framing and sheathing.
5. Division 7 Section "Manufactured Wall Panels" for preformed metal wall panels.
6. Division 7 Section "Sheet Metal Roofing" for field-formed sheet metal roofing.
7. Division 7 Section "Sheet Metal Flashing and Trim" for flashing not part of roofing and other sheet metal work.
8. Division 7 Section "Joint Sealants" for field-applied sealants.
9. Division 9 Section "Painting" for priming and painting installed roof panels.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide manufactured roof panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

B. Air Infiltration: Provide manufactured roof panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. (0.45 L/s/sq. m) of fixed roof area when tested according to ASTM E 1680 at a static-air-pressure difference of 4.0 lbf/sq. ft. (192 Pa).

C. Water Penetration: Provide manufactured roof panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 1646 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 6.24 lb/sq. ft. (300 Pa) and not more than 12.0 lb/sq. ft. (575 Pa).

D. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements of UL 580 for Class 90 wind-uplift resistance.

E. Structural Performance: Provide manufactured roof panel assemblies capable of safely supporting design loads indicated under in-service conditions with vertical deflection no greater than the following, based on testing manufacturer's standard units according to ASTM E 1592 by a qualified independent testing and inspecting agency.

1. Maximum Deflection: 1/180 of the span.
2. Maximum Deflection: 1/140 of the span.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

B. Shop Drawings: Show layouts of panels on roofs, details of edge conditions, joints, panel profiles, supports, anchorages, trim, flashings, underlayment, closures, snow guards, and special details. Distinguish between factory- and field-assembled work.

1. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: Manufacturer's color charts or chips showing the full range of colors, textures, and patterns available for roof panels with factory-applied finishes.

D. Samples for Verification: Provide sample panels 12 inches (300 mm) long by actual panel width, in the profile, style, color, and texture indicated. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.

E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product Test Reports: Indicate compliance of manufactured roof panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed metal roof panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 699.

D. Fire-Test-Response Characteristics: Where fire-resistance-rated roof panel assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per

ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: As indicated by design designations in UL's "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.

B. Handling: Exercise care in unloading, storing, and erecting roof panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish opening dimensions and proceed with fabricating roof panels without field measurements or allow for trimming panel units. Coordinate roof construction to ensure actual locations of structural members and to ensure opening dimensions correspond to established dimensions.

1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal roof panels within the specified warranty period and agreeing to repair finish or replace roof panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.

C. Finish Warranty Period: 20 years from date of Substantial Completion.

D. Special Weathertight Warranty: Submit a written warranty executed by manufacturer agreeing to repair or replace metal roof panel assembly that fails to remain weathertight within the specified warranty period.

E. Weathertight Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal panels that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide panels by one of the following:

1. Steel Roof Panels:
2. Copper Roof Panels:
3. Stainless-Steel Roof Panels:
4. Terne-Coated, Stainless-Steel Roof Panels:

a. AEP-Span.
b. American Buildings Roofing and Architectural Products.
c. Architectural Building Components.
d. Architectural Roofing and Siding, Inc.
e. Berridge Manufacturing Co.
f. BHP Steel Building Products USA Inc.
g. Butler Manufacturing Co.
h. Carlisle Engineered Metals.
i. Copper Sales, Inc.
j. Delcoa Industries, Inc.
k. Englert, Inc.
l. Fabral/Gentec Building Products, Inc.
m. Fashion, Inc.
n. Flexospan, Inc.
o. Innovative Metals Co., Inc.
p. K-Metals, Inc.
q. McElroy Metal, Inc.
r. Merchant & Evans, Inc.
s. Metal Building Components, Inc.
t. Metal Sales Mfg. Corp.
u. Modern Metal Systems, Inc.
v. Morin Corporation.
w. NCI Building Components.
x. Perma-Clad Products, Inc.
y. Petersen Aluminum Corp.
z. Robertson: H.H. Robertson Company.
aa. Smith Steelite, Inc.
ab. Steelco/MCP.
ac. Steelox Roofing Systems, Inc.
ad. Taylor Metal Products, Inc.
ae. VicWest Steel.
af. Vincent Metals.

5. Aluminum Roof Panels:

a. Architectural Building Components.
b. Architectural Roofing and Siding, Inc.
c. Atas Aluminum Corp.

d. Cheney Flashing Company.
e. Columbia Architectural Products, Inc.
f. Copper Sales, Inc.
g. Delcoa Industries, Inc.
h. Englert, Inc.
i. Fabral/Gentec Building Products, Inc.
j. Fashion, Inc.
k. Flexospan, Inc.
l. McElroy Metal, Inc.
m. Merchant & Evans, Inc.
n. Metal Building Components, Inc.
o. Perma-Clad Products, Inc.
p. Petersen Aluminum Corp.
q. Vincent Metals.

6. Steel-Faced, Insulated Roof Panels:

a. Aluma Shield Industries, Inc.
b. Architectural Roofing and Siding, Inc.
c. Butler Manufacturing Co.
d. Carlisle Engineered Metals.
e. Metl-Span Corp.
f. Morin Corporation.
g. Robertson: H.H. Robertson Company.

7. Aluminum-Faced, Insulated Roof Panels:

a. Architectural Roofing and Siding, Inc.
b. Columbia Architectural Products, Inc.
c. Metl-Span Corp.

2.2 METALS AND FINISHES

A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755 (ASTM A 755M) and the following requirements:

1. Galvanized Steel Sheet: ASTM A 653, G90 (ASTM A 653M, Z275); structural quality.
2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, Class AZ-50 coating, Grade 40 (ASTM A 792M, Class AZ-150 coating, Grade 275); structural quality.
3. Aluminum-Coated Steel Sheet: ASTM A 463, T1-40 (ASTM A 463M, T1-120) coating.
4. Thickness: 0.034 inch (0.85 mm), unless otherwise indicated.
5. Thickness: 0.028 inch (0.7 mm), unless otherwise indicated.
6. Batten Caps: 0.028 inch (0.7 mm) thick.
7. Finish: Apply the following organic coating in thickness indicated. Furnish appropriate air-drying spray finish in matching color for touchup.

a. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight with a total minimum dry film thickness of 0.9 mil (0.023 mm) and 30 percent reflective gloss when tested according to ASTM D 523.

1) Durability: Provide coating field tested under normal range of weather conditions for a minimum of 20 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of a chalk rating of 8 according to ASTM D 4214; and without fading in excess of 5 Hunter units.

b. Siliconized Polyester Coating: Consisting of epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

c. Acrylic-Enamel Coating: Consisting of epoxy primer and acrylic-enamel topcoat, with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

1) Color: As indicated by manufacturer's color designations.
2) Color: Match Architect's sample.
3) Color: As selected by Architect from manufacturer's full range of colors.

d. Prime Coating: Where painting after installation is indicated, provide pretreatment and white or light-colored, baked-on epoxy primer coat; with a minimum dry film thickness of 0.2 mil (0.005 mm).

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M) for alclad alloy 3003 or 3004, with temper as required to suit forming operations and complying with the following requirements:

1. Surface: Smooth, flat, mill finish.
2. Surface: Manufacturer's standard stucco-embossed finish.
3. Alternative alloys include 1100; alclad 3003, 3004, 3105, 5005, and 5050; in A14, H14, H24, H32, or H34 temper.
4. Thickness: 0.032 inch (0.8 mm), unless otherwise indicated.
5. Thickness: 0.040 inch (1.0 mm), unless otherwise indicated.
6. Batten Caps: 0.032 inch (0.8 mm) thick.
7. High-Performance Organic Coating Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

a. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 1402, Test Method No. 7.

b. Fluoropolymer 3-Coat Coating System: Manufacturer's standard 3-coat, thermocured system composed of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 1402, Test Method No. 7.

1) Color and Gloss: As indicated by manufacturer's color and gloss designations.
2) Color and Gloss: Match Architect's sample.
3) Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

c. Siliconized Polyester Coating: Consisting of epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

d. Acrylic-Enamel Coating: Consisting of epoxy primer and acrylic-enamel topcoat, with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

1) Color: As indicated by manufacturer's color and gloss designations.
2) Color: Match Architect's sample.
3) Color: As selected by Architect from manufacturer's full range of choices for color.

C. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 temper, unless otherwise indicated.

1. Weight (Thickness): 16 oz./sq. ft. (0.55 mm), unless otherwise indicated.
2. Weight (Thickness): 20 oz./sq. ft. (0.7 mm), unless otherwise indicated.
3. Batten Caps: 20-oz./sq. ft. (0.7-mm-thick) copper, unless otherwise indicated.

D. Stainless-Steel Sheet: ASTM A 666, Type 304, dead soft, fully annealed.

1. Finish: 2D (dull).
2. Finish: 2B (bright).
3. Thickness: 0.015 inch (0.4 mm), unless otherwise indicated.
4. Thickness: 0.018 inch (0.5 mm), unless otherwise indicated.
5. Batten Caps: 0.018-inch- (0.5-mm-) thick stainless steel, unless otherwise indicated.

E. Terne-Coated, Stainless-Steel Sheet: ASTM A 666, Type 304, dead-soft, fully annealed stainless-steel sheet, coated on both sides with terne alloy (80 percent lead, 20 percent tin) to produce a nominal total coating weight of 1.45 oz./sq. ft. (440 g/sq. m).

1. Thickness and Weight: 0.015 inch (0.4 mm) plus coating, weighing approximately 0.71 lb/sq. ft. (3.5 kg/sq. m) including coating, unless otherwise indicated.
2. Thickness and Weight: 0.018 inch (0.5 mm) plus coating, weighing approximately 0.82 lb/sq. ft. (4 kg/sq. m) including coating, unless otherwise indicated.
3. Thickness and Weight: 0.024 inch (0.6 mm) plus coating, weighing approximately 1.07 lb/sq. ft. (5.2 kg/sq. m) including coating, unless otherwise indicated.
4. Batten Caps: 0.018-inch- (0.5-mm-) thick, terne-coated stainless steel, unless otherwise indicated.
5. In lieu of spot tests to determine coating weight, manufacturer may submit nondestructive radiographic test results and certification showing that terne-coating weight of sheets furnished for Project complies with requirements.

2.3 ROOF PANEL ASSEMBLIES

A. Lap-Seam Roof Panels: Manufacturer's standard factory-formed, lap-seam roof panel assembly designed for mechanical attachment of panels to roof purlins or deck using exposed fasteners and sealants.

B. Standing-Seam Roof Panels: Manufacturer's standard factory-formed, standing-seam roof panel assembly designed for concealed mechanical attachment of panels to roof purlins or deck.

1. Clips: Provide minimum 0.0625-inch- (1.6-mm-) thick, stainless-steel panel clips designed to meet negative-load requirements.
2. Cleats: Mechanically seamed cleats formed from minimum 0.0250-inch- (0.65-mm-) thick, stainless-steel or nylon-coated aluminum sheets.

C. Batten-Seam Roof Panels: Manufacturer's standard factory-formed, batten-seam roof panel assembly designed to be installed between and attach to battens attached to the roof.

D. Insulated Roof Panels: Provide factory-assembled panels consisting of a specified core material laminated or otherwise securely bonded to specified metal interior and exterior face sheets with specified finish. Fabricate panels in a manner that will eliminate condensation on the interior side. Design joints between panels to form weathertight seals. Insulating core of panels shall provide U-value indicated and be of the following material:

1. Honeycomb core slabs with maximum 1-inch (25-mm) hexagonal-shaped cells, of thickness indicated, made of the following material:

   a. Kraft Paper: Manufacturer's standard 16 percent resin-impregnated paper, a minimum of 80 lb (36 kg) per ream, chemically treated to be fire retardant to produce flame-spread and smoke-developed ratings of not more than 15 and 250, respectively, when tested according to ASTM E 84.
   b. Aluminum Sheet: Commercial grade, 0.003 inch (0.08 mm) thick.

2. Poured-in-Place Polyisocyanurate Foam: Modified isocyanurate foam with a minimum of 90 percent closed-cell structure and the following characteristics:

   a. Density: 2.2 to 2.6 lb/cu. ft. (35 to 42 kg/cu. m).
   b. Compressive Strength: 20 psi (140 kPa) minimum.
   c. Tensile Strength: 30 psi (200 kPa) minimum.
   d. Humid Aging: 250 hours at 122 deg F (50 deg C), 100 percent humidity, 6 percent maximum increase.
   e. Heat Aging: 250 hours at 180 deg F (82 deg C), 100 percent humidity, 4 percent maximum increase.

3. Thermal Insulation: Rigid or semirigid boards of the following type specified in this Section:

   a. Polyisocyanurate.
   b. Extruded polystyrene.
   c. Molded polystyrene.
   d. Glass fiber.

2.4 THERMAL INSULATION

A. Polyisocyanurate Board Insulation: Unfaced, preformed, rigid, cellular, polyisocyanurate thermal insulation complying with ASTM C 591, Type 2, with aged thermal-resistance values for 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (1.1 K x sq. m/W at 24 deg C).

B. Extruded-Polystyrene Board Insulation: Rigid, cellular, thermal insulation formed from polystyrene base resin by an extrusion process to comply with ASTM C 578, Type IV, 1.60-lb/cu. ft. (26-kg/cu. m) minimum density, unless otherwise indicated.

C. Molded-Polystyrene Board Insulation: Rigid, cellular, thermal insulation formed by the expansion of polystyrene resin beads or granules in a closed mold to comply with ASTM C 578, for type indicated below:

1. Type I, 0.9-lb/cu. ft. (14.4-kg/cu. m) minimum density.
2. Type II, 1.35-lb/cu. ft. (21.6-kg/cu. m) minimum density.

D. Glass-Fiberboard Insulation: Thermal insulation combining glass fibers with thermosetting resin binders to comply with ASTM C 612, Type IA and IB, with a nominal density of 3 lb/cu. ft. (48 kg/cu. m) and a thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).

E. Metal Building Insulation: Glass-fiber-blanket insulation, complying with ASTM C 991, Type II, of 0.5-lb/cu. ft. (8-kg/cu. m) density, thickness as indicated, with a flame-spread rating of 25 or less, and 2-inch- (50-mm-) wide, continuous, vapor-tight edge tabs.

1. Facing: Vinyl-reinforced polyester.
2. Facing: Vinyl-reinforced foil.
3. Facing: Foil-reinforced kraft paper.
4. Facing: Polypropylene-reinforced polyester.
5. Retainer Strips: 0.019-inch (0.5-mm) thick, formed, galvanized steel retainer clips colored to match insulation facing.

F. Mineral-Fiber-Blanket Insulation: Thermal insulation combining glass or slag/rock-wool fibers with thermosetting resins to comply with ASTM C 665 and as follows:

1. Type I: Unfaced.
2. Type II: Faced one side with nonreflective vapor-retarder membrane.
3. Type III: Faced one side with reflective vapor-retarder membrane.

a. Class A: Membrane-faced surface with a flame-spread rating of 25 or less.

2.5 UNDERLAYMENT MATERIALS

A. Fabric Underlayment: Manufacturer's standard nonwoven polyester fabric marketed for use in cold-applied, single-ply roofing weighing 6.0 oz./sq. yd. (200 g/sq. m), white, nonswelling, rot and mildew resistant.

1. Product: Subject to compliance with requirements, provide "E6N Rufon Fabric" by Amoco Fabric and Fiber Co.

B. Polyethylene Underlayment: Minimum 6-mil- (0.15-mm-) thick polyethylene sheeting complying with ASTM D 4397.

C. Self-Adhering, Polymer-Modified, Bituminous Sheet Underlayment: ASTM D 1970, minimum of 40 mils (1 mm) thick. Provide primer when recommended by underlayment manufacturer.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. WinterGuard; CertainTeed Corporation.
b. Bituthene Ice and Water Shield; Grace: W.R. Grace & Co.
c. Nordshield Ice and WaterGard; Nord Bitumi US, Inc.
d. F210; Northern Elastomeric, Inc.
e. Polyguard Deck Guard; Polyguard Products, Inc.
f. Polyken 640 Underlayment Membrane; Polyken Technologies.
g. QSC-707; Quaker Construction Products, Inc.
h. Moisture Guard; Tamko Asphalt Products, Inc.
i. Weather Watch; GAF Building Materials Corporation.
j. Jiffy Seal Ice and Water Guard; Protecto Wrap Co.

k. Ice Guard Membrane No. 108-AG; Royston Laboratories, Inc.

D. Building Paper: Minimum 5 lb/100 sq. ft. (2.4 kg/sq. m), rosin sized.

E. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felts.

F. Felts: ASTM D 226, Type I (No. 15), asphalt-saturated organic felts.

2.6 MISCELLANEOUS MATERIALS

A. General: Provide materials and accessories required for a complete roof panel assembly and as recommended by panel manufacturer, unless otherwise indicated.

B. Translucent Panels: Glass-fiber-reinforced, polyester, translucent, plastic glazing panels complying with ASTM D 3841, Type CC1, limited flammability, Grade 2, weather resistant, crinkle finish both sides, weighing not less than 8 oz./sq. ft. (2.5 kg/sq. m). Match configuration of adjacent metal panels.

C. Translucent Panels: Glass-fiber-reinforced, polyester, translucent, plastic glazing panels complying with ASTM D 3841, Type CC2, general purpose, Grade 2, weather resistant, crinkle finish both sides, weighing not less than 8 oz./sq. ft. (2.5 kg/sq. m). Match configuration of adjacent metal panels.

1. Color: White.
2. Color: Green.
3. Color: Tan.
4. Color: Blue.
5. Mastic: Nonstaining, saturated, vinyl polymer as recommended by panel manufacturer for sealing laps.

D. Laminated Backer Board: Hardboard that complies with ANSI A135.4, Class 1 tempered, 1/8 inch (3 mm) thick, unless otherwise indicated.

E. Gypsum Board: Type X, of thicknesses indicated, complying with ASTM C 442 or ASTM C 36.

F. Thermal Spacers: Where panels attach directly to purlins, provide thermal spacers recommended by panel manufacturer.

G. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Use stainless-steel fasteners for exterior applications and galvanized steel fasteners for interior applications.
2. Use aluminum or stainless-steel fasteners for exterior applications and aluminum or galvanized steel fasteners for interior applications.
3. Provide exposed fasteners with heads matching color of panel by means of plastic caps or factory-applied coating.
4. Provide metal-backed neoprene washers under heads of exposed fasteners bearing on weather side of panels.
5. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.

H. Accessories: Unless otherwise specified, provide components required for a complete roof panel assembly including trim, copings, fasciae, mullions, sills, corner units, ridge closures, clips, seam

covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.

1. Closure Strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or cross-linked, polyolefin-foam flexible closure strips. Cut or premold to match configuration of panels. Provide closure strips where indicated or necessary to ensure weathertight construction.
2. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
3. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to seal joints in panel roofing and remain weathertight. Provide sealant recommended by panel manufacturer.

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat, unless otherwise indicated. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

J. Expansion-Joint Sealant: For hooked-type expansion joints that must be free to move, provide nonsetting, nonhardening, nonmigrating, heavy-bodied polyisobutylene sealant.

K. Primer: Rust-inhibitive primer recommended by panel manufacturer for finish coat.

L. Snow Guards: Prefabricated, noncorrosive units designed to use with roof panels and complete with predrilled holes or hooks for anchoring.

2.7 FABRICATION

A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Sound Control: Where sound-absorption requirement is indicated, fabricate interior liner panels with 1/8-inch- (3-mm-) diameter holes uniformly spaced approximately 1000 holes per square foot (10 750 holes per square meter). Cover insulation with polyethylene film and provide inserts of wire mesh to form acoustical spacer grid.

C. Fabricate panel joints with captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

2.8 PANEL SUPPORTS AND ANCHORAGE

A. Secondary Framing: Provide components complying with the Light Gage Structural Institute's "Guide Specifications," Section 07410, "Manufactured Roof and Wall Panels."

1. Roof Purlins: C- or Z-shaped sections fabricated from 0.0598-inch- (1.5-mm-) thick, shop-painted, roll-formed steel. Purlin spacers fabricated from 0.079-inch- (2.0-mm-) thick, cold-formed, galvanized steel sections.
2. Eave Struts: Unequal flange, C-shaped sections formed to provide adequate back-up for roof panels. Fabricate from 0.0598-inch- (1.5-mm-) thick, shop-painted, roll-formed steel.
3. Flange and Sag Bracing: 1-5/8-by-1-5/8-inch (41-by-41-mm) angles, fabricated from 0.0598-inch- (1.5-mm-) thick, shop-painted, roll-formed steel.

4. Base or Sill Angles: Fabricate from 0.079-inch- (2.0-mm-) thick, cold-formed, galvanized steel sections.
5. Secondary structural members, except columns and beams, shall be manufacturer's standard sections fabricated from 0.079-inch- (2.0-mm-) thick, cold-formed galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panel roofing.

1. Panel Supports and Anchorage: Examine roof framing to verify that purlins, angles, channels, and other secondary structural panel support members and anchorage have been installed according to written instructions of panel manufacturer.
2. Do not proceed with roof panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate metal panel roofing with rain drainage work; flashing; trim; and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

B. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

C. Secondary Structural Supports: Install purlins, bracing, and other secondary structural panel support members and anchorage according to the Light Gage Structural Institute's "Guide Specifications," Section 07410, "Manufactured Roof and Wall Panels."

3.3 PANEL INSTALLATION

A. General: Comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting exterior panels by torch is not permitted.
2. Install panels with concealed fasteners, unless otherwise indicated.
3. Install panels with exposed exterior and interior fasteners, prefinished to match panel finishes.
4. Install panels over solid substrate with minimum 3:12 (1:4) slope. Install 1 ply of felt from lower edge up, with at least 3-inch (75-mm) side laps and 4-inch (100-mm) end laps.

B. Accessories: Install components required for a complete roof panel assembly including trim, copings, fasciae, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items.

C. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.

D. Install felt underlayment and building-paper slip sheet on roof deck under metal panels, unless otherwise recommended by panel manufacturer. Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under metal panels. Apply from eave to ridge in shingle fashion and lap joints a minimum of 2 inches (50 mm).

E. Coat back side of metal panels with bituminous coating where it will contact wood, ferrous metal, or cementitious construction.

F. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.

1. Install weatherseal under ridge cap. Flash and seal panels at eave and rake with rubber, neoprene, or other closures to exclude weather.
2. Seal panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by panel manufacturer.
3. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

G. Lap-Seam Roof Panels: Provide sealant tape at lapped joints of ribbed or fluted panels and between panels and protruding equipment, vents, and accessories.

1. Apply a continuous ribbon of sealant tape to clean, dry surface of the weather side of fastenings on end laps; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.

H. Standing-Seam Roof Panel Assembly: Fasten panels to supports with concealed clip according to panel manufacturer's written instructions.

1. Install clips at each support with self-drilling/self-tapping fasteners.
2. At end laps of panels, install tape calk between panels.
3. Install factory-calked cleats at standing-seam joints. Apply snap-on batten to panels to provide a weathertight joint.
4. Seaming: Complete seaming of panel joints by operating portable power-driven equipment of type recommended by panel manufacturer to provide a weathertight joint.

I. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.4 CLEANING AND PROTECTING

A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION 07411

SECTION 07412 - MANUFACTURED WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Metal wall panels with exposed fasteners.
2. Metal wall panels with concealed fasteners.
3. Field-assembled, insulated wall panels with concealed fasteners.
4. Factory-assembled, insulated wall panels with gasketed seams.
5. Formed wall panels of type and profile indicated.

B. Related Sections include the following:

1. Division 5 Section "Structural Steel" for structural-steel framing.
2. Division 5 Section "Cold-Formed Metal Framing" for metal studs, bracing, anchorage, and framing accessories.
3. Division 6 Section "Rough Carpentry" for wood framing.
4. Division 7 Section "Manufactured Roof Panels" for preformed metal roof panels.
5. Division 7 Section "Sheet Metal Flashing and Trim" for metal flashing and trim not part of this Work.
6. Division 7 Section "Joint Sealants" for field-applied sealants.
7. Division 9 Section "Painting" for priming and painting installed wall panels.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide manufactured wall panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

B. Air Infiltration: Provide manufactured wall panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. (0.45 L/s/sq. m) of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 4.0 lbf/sq. ft. (192 Pa).

C. Water Penetration: Provide manufactured wall panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 6.24 lb/sq. ft. (300 Pa) and not more than 12.0 lb/sq. ft. (575 Pa).

D. Structural Performance: Provide manufactured wall panel assemblies capable of withstanding design wind loads indicated under in-service conditions with deflection no greater than the following, based on

testing manufacturer's standard units according to ASTM E 330 by a qualified independent testing and inspecting agency.

1. Maximum Deflection: 1/180 of the span.
2. Maximum Deflection: 1/140 of the span.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

B. Shop Drawings: Show layouts of panels, details of corner conditions, joints, panel profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work.

1. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: Manufacturer's color charts or chips showing the full range of colors, textures, and patterns available for wall panels with factory-applied finishes.

D. Samples for Verification: Provide sample panels 12 inches (300 mm) long by actual panel width, in the profile, style, color, and texture indicated. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.

E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product Test Reports: Indicate compliance of manufactured wall panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed metal wall panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 699.

D. Fire-Test-Response Characteristics: Where fire-resistance-rated wall panel assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: As indicated by design designations in UL's "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Mockups: Before installing wall panels, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using exposed and concealed materials indicated for the completed Work.

1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before proceeding with construction of wall panels.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

a. When directed, remove mockups from Project site.
b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.

B. Handling: Exercise care in unloading, storing, and erecting wall panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish opening dimensions and proceed with fabricating wall panels without field measurements or allow for trimming panel units. Coordinate wall construction to ensure actual locations of structural members and to ensure opening dimensions correspond to established dimensions.

1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal wall panels within the specified warranty period and agreeing to repair finish or replace wall panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.

C. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal panels that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide panels by one of the following:

1. Steel Wall Panels:
2. Stainless-Steel Wall Panels:

a. American Buildings Roofing and Architectural Products.
b. Architectural Roofing and Siding, Inc.
c. Atas Aluminum Corp.
d. Berridge Manufacturing Co.
e. BHP Steel Building Products USA Inc.
f. Carlisle Engineered Metals.
g. Copper Sales, Inc.
h. Fabral/Gentec Building Products, Inc.
i. Flexospan, Inc.
j. K-Metals, Inc.
k. Merchant & Evans, Inc.
l. Metal Building Components, Inc.
m. Metal Sales Mfg. Corp.
n. Modern Metal Systems, Inc.
o. Morin Corporation.
p. NCI Building Components.
q. Petersen Aluminum Corp.
r. Reynolds Metals Company.
s. Robertson: H.H. Robertson Company.
t. Smith Steelite, Inc.
u. Steelco/MCP.
v. VicWest Steel.

3. Aluminum Wall Panels:

a. Architectural Specialty Products, Inc.
b. Atas Aluminum Corp.
c. Carlisle Engineered Metals.
d. Columbia Architectural Products, Inc.
e. Copper Sales, Inc.
f. Fabral/Gentec Building Products, Inc.
g. Merchant & Evans, Inc.

h. Petersen Aluminum Corp.
i. Reynolds Metals Company.
j. Robertson: H.H. Robertson Company.

4. Steel-Faced, Insulated Wall Panels:

a. Alply, Inc.
b. Aluma Shield Industries, Inc.
c. Architectural Roofing and Siding, Inc.
d. Architectural Specialty Products, Inc.
e. Carlisle Engineered Metals.
f. Copper Sales, Inc.
g. Lamit Industries, Inc.; Benchmark Division.
h. Metl-Span Corp.
i. Morin Corporation.
j. Protean Construction Products, Inc.
k. Robertson: H.H. Robertson Company.
l. Smith Steelite, Inc.

5. Aluminum-Faced, Insulated Wall Panels:

a. Alply, Inc.
b. Architectural Specialty Products, Inc.
c. Columbia Architectural Products.
d. Copper Sales, Inc.
e. Lamit Industries, Inc.; Benchmark Division.
f. Metl-Span Corp.
g. Protean Construction Products, Inc.
h. Robertson: H.H. Robertson Company.

2.2 METALS AND FINISHES

A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755 (ASTM A 755M) and the following requirements:

1. Galvanized Steel Sheet: ASTM A 653, G90 (ASTM A 653M, Z275); structural quality.
2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, Class AZ-50 coating, Grade 40 (ASTM A 792M, Class AZ-150 coating, Grade 275); structural quality.
3. Aluminum-Coated Steel Sheet: ASTM A 463, T1-40 (ASTM A 463M, T1-120) coating.
4. Surface: Smooth, flat, mill finish.
5. Surface: Manufacturer's standard stucco-embossed finish.
6. Exposed Finish for Exterior Panels: Apply the following coating in thickness indicated. Furnish appropriate air-drying spray finish in matching color for touchup.

a. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight with a total minimum dry film thickness of 0.9 mil (0.023 mm) and 30 percent reflective gloss when tested according to ASTM D 523.

1) Durability: Provide coating field tested under normal range of weather conditions for a minimum of 20 years without significant peel, blister, flake, chip, crack, or

check in finish; without chalking in excess of a chalk rating of 8 according to ASTM D 4214; and without fading in excess of 5 Hunter units.

b. Siliconized Polyester Coating: Consisting of epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

c. Acrylic-Enamel Coating: Consisting of epoxy primer and acrylic-enamel topcoat, with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

1) Color: As indicated by manufacturer's color designations.
2) Color: Match Architect's sample.
3) Color: As selected by Architect from manufacturer's full range of colors.

7. Exposed Finish for Interior Panels: Apply the following:

a. Siliconized Polyester Coating: Consisting of epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

b. Acrylic-Enamel Coating: Consisting of epoxy primer and acrylic-enamel topcoat, with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

1) Color: As indicated by manufacturer's color designations.
2) Color: Match Architect's sample.
3) Color: As selected by Architect from manufacturer's full range of choices for colors.

c. Prime Coating: Where painting after installation is indicated, provide pretreatment and white or light-colored, baked-on polyester primer coat; with a minimum dry film thickness of 0.2 mil (0.005 mm).

8. Prime Coat for Concealed Surfaces: Apply pretreatment and white or light-colored, baked-on polyester primer coat; with a minimum dry film thickness of 0.2 mil (0.005 mm).

B. Aluminum Sheet Prepainted with Coil Coating: Aluminum sheet complying with ASTM B 209 (ASTM B 209M) for alclad alloy 3003 or 3004, with temper as required to suit forming operations, prepainted by the coil-coating process and complying with the following requirements:

1. Surface: Smooth, flat, mill finish.
2. Surface: Manufacturer's standard stucco-embossed finish.
3. Alternative alloys include 1100; alclad 3003, 3004, 3105, 5005, and 5050; in A14, H14, H24, H32, or H34 temper.
4. Exposed Finish for Exterior Panels: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

a. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 1402, Test Method No. 7.

b. Fluoropolymer 3-Coat Coating System: Manufacturer's standard 3-coat, thermocured system composed of specially formulated inhibitive primer, fluoropolymer color coat, and

clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 1402, Test Method No. 7.

1) Color and Gloss: As indicated by manufacturer's color and gloss designations.
2) Color and Gloss: Match Architect's sample.
3) Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

c. Siliconized Polyester Coating: Consisting of epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
d. Acrylic-Enamel Coating: Consisting of epoxy primer and acrylic-enamel topcoat, with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

1) Color: As indicated by manufacturer's color designations.
2) Color: Match Architect's sample.
3) Color: As selected by Architect from manufacturer's full range of choices for colors.

5. Exposed Finish for Interior Panels: Apply the following:

a. Siliconized Polyester Coating: Consisting of epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
b. Acrylic-Enamel Coating: Consisting of epoxy primer and acrylic-enamel topcoat, with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

1) Color: As indicated by manufacturer's color designations.
2) Color: Match Architect's sample.
3) Color: As selected by Architect from manufacturer's full range of choices for colors.

c. Prime Coating: Where painting after installation is indicated, provide pretreatment and white or light-colored, baked-on polyester primer coat; with a minimum dry film thickness of 0.2 mil (0.005 mm).

6. Prime Coat for Concealed Surfaces: Apply pretreatment and white or light-colored, baked-on polyester primer coat; with a minimum dry film thickness of 0.2 mil (0.005 mm).

C. Stainless-Steel Sheet: ASTM A 666, Type 304, dead soft, fully annealed.

1. Finish: 2D (dull).
2. Finish: 2B (bright).

2.3 WALL PANEL ASSEMBLIES

A. Exterior Wall Panels: Fabricate panel face sheets to the profile or configuration indicated; and of the material, finish, and thickness indicated. Design joints between panels to form weathertight seals.

1. Steel Face Sheet: 0.028-inch- (0.7-mm-) thick, metallic-coated steel sheet with organic coating finish, unless otherwise indicated.
2. Aluminum Face Sheet: 0.040-inch- (1.0-mm-) thick, stucco-embossed-surface aluminum sheet with organic coating finish, unless otherwise indicated.
3. Stainless-Steel Face Sheet: 0.0187-inch- (0.5-mm-) thick, stainless-steel sheet with No. 2D (dull) finish, unless otherwise indicated.

B. Interior Wall Panels: Fabricate interior panel liner face sheets to the profile or configuration indicated; and of the material, finish, and thickness indicated.

1. Steel Face Sheet: 0.022-inch- (0.55-mm-) thick, metallic-coated steel sheet with organic coating finish, unless otherwise indicated.
2. Aluminum Face Sheet: 0.032-inch- (0.8-mm-) thick, smooth-surface aluminum sheet with organic coating finish, unless otherwise indicated.
3. Stainless-Steel Face Sheet: 0.0156-inch- (0.4-mm-) thick, stainless-steel sheet with No. 2B (bright) finish, unless otherwise indicated.

C. Insulated Wall Panels: Fabricate panels in a manner that will eliminate condensation on the interior side. Design joints between panels to form weathertight seals. Insulating core of panels shall provide U-value indicated.

1. Provide field-assembled, wall panel units consisting of an insulating material between metal interior and exterior face sheets. Securely fasten units together with rivets, bolts, studs, or other approved methods of fastening, including interlocking with basic wall units.

    a. Exterior Face Sheet: 0.028-inch- (0.7-mm-) thick, metallic-coated steel sheet with organic coating finish, unless otherwise indicated.
    b. Interior Face Sheet: 0.022-inch- (0.55-mm-) thick, metallic-coated steel sheet with organic coating finish, unless otherwise indicated.
    c. Exterior Face Sheet: 0.040-inch- (1.0-mm-) thick, aluminum sheet with organic coating finish, unless otherwise indicated.
    d. Interior Face Sheet: 0.032-inch- (0.8-mm-) thick, aluminum sheet with organic coating finish, unless otherwise indicated.
    e. Exterior Face Sheet: 0.0187-inch- (0.5-mm-) thick, stainless-steel sheet with No. 2D (dull) finish, unless otherwise indicated.
    f. Interior Face Sheet: 0.0156-inch- (0.4-mm-) thick, stainless-steel sheet with No. 2B (bright) finish, unless otherwise indicated.

2. Provide factory-assembled, wall panel units consisting of a specified core material laminated or otherwise securely bonded to metal interior and exterior face sheets.

    a. Exterior Face Sheet: 0.022-inch- (0.55-mm-) thick, metallic-coated steel sheet with organic coating finish, unless otherwise indicated.
    b. Interior Face Sheet: 0.019-inch- (0.5-mm-) thick, metallic-coated steel sheet with organic coating finish, unless otherwise indicated.
    c. Exterior Face Sheet: 0.032-inch- (0.8-mm-) thick, stucco-embossed-surface aluminum sheets with organic coating finish, unless otherwise indicated.
    d. Interior Face Sheet: 0.032-inch- (0.8-mm-) thick, smooth-surface aluminum sheets with organic coating finish, unless otherwise indicated.
    e. Exterior Face Sheet: 0.0156-inch- (0.4-mm-) thick, stainless-steel sheet with No. 2D (dull) finish, unless otherwise indicated.
    f. Interior Face Sheet: 0.0156-inch- (0.4-mm-) thick, stainless-steel sheet with No. 2B (bright) finish, unless otherwise indicated.

2.4 CORE MATERIALS

A. Honeycomb core slabs with maximum 1-inch (25-mm) hexagonal-shaped cells, of thickness indicated, made of the following material:

1. Kraft Paper: Manufacturer's standard 16 percent resin-impregnated paper, a minimum of 80 lb (36 kg) per ream, chemically treated to be fire retardant to produce flame-spread and smoke-developed ratings of not more than 15 and 250, respectively, when tested according to ASTM E 84.
2. Aluminum Sheet: Commercial grade, 0.003 inch (0.08 mm) thick.

B. Poured-in-Place Polyisocyanurate Foam: Modified isocyanurate foam with at least 90 percent closed-cell structure and the following characteristics:

1. Density: 2.2 to 2.6 lb/cu. ft. (35 to 42 kg/cu. m).
2. Compressive Strength: 20 psi (140 kPa) minimum.
3. Tensile Strength: 30 psi (200 kPa) minimum.
4. Humid Aging: 250 hours at 122 deg F (50 deg C), 100 percent humidity, 6 percent maximum increase.
5. Heat Aging: 250 hours at 180 deg F (82 deg C), 100 percent humidity, 4 percent maximum increase.

C. Polyisocyanurate Board Insulation: Unfaced, preformed, rigid, cellular, polyisocyanurate thermal insulation complying with ASTM C 591, Type 2, with aged thermal-resistance values for 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (1.1 K x sq. m/W at 24 deg C).

D. Extruded-Polystyrene Board Insulation: Rigid, cellular, thermal insulation formed from polystyrene base resin by an extrusion process to comply with ASTM C 578, Type IV, 1.60-lb/cu. ft. (26-kg/cu. m) minimum density, unless otherwise indicated.

E. Molded-Polystyrene Board Insulation: Rigid, cellular, thermal insulation formed by the expansion of polystyrene resin beads or granules in a closed mold to comply with ASTM C 578, for type indicated below:

1. Type I, 0.9-lb/cu. ft. (14.4-kg/cu. m) minimum density.
2. Type II, 1.35-lb/cu. ft. (21.6-kg/cu. m) minimum density.

F. Glass-Fiberboard Insulation: Thermal insulation combining glass fibers with thermosetting resin binders to comply with ASTM C 612, Type IA and IB, with a nominal density of 3 lb/cu. ft. (48 kg/cu. m) and a thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).

2.5 BLANKET WALL INSULATION

A. Metal Building Insulation: Glass-fiber-blanket insulation, complying with ASTM C 991, Type II, of 0.5-lb/cu. ft. (8-kg/cu. m) density, thickness as indicated, with a flame-spread rating of 25 or less, and 2-inch- (50-mm-) wide, continuous, vapor-tight edge tabs.

1. Facing: Vinyl-reinforced polyester.
2. Facing: Vinyl-reinforced foil.
3. Facing: Foil-reinforced kraft paper.
4. Facing: Polypropylene-reinforced polyester.

5. Retainer Strips: 0.019-inch (0.5-mm) thick, formed, galvanized steel retainer clips colored to match insulation facing.

B. Mineral-Fiber-Blanket Insulation: Thermal insulation combining glass or slag/rock-wool fibers with thermosetting resins to comply with ASTM C 665 and as follows:

1. Type I: Unfaced.
2. Type II: Faced one side with nonreflective vapor-retarder membrane.
3. Type III: Faced one side with reflective vapor-retarder membrane.

a. Class A: Membrane-faced surface with a flame-spread rating of 25 or less.

2.6 MISCELLANEOUS MATERIALS

A. Laminated Backer Board: Hardboard that complies with ANSI A135.4, Class 1 tempered, 1/8 inch (3 mm) thick, unless otherwise indicated.

B. Gypsum Board: Type X, of thicknesses indicated, complying with ASTM C 442 or ASTM C 36.

C. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Use stainless-steel fasteners for exterior applications and galvanized steel fasteners for interior applications.
2. Use aluminum or stainless-steel fasteners for exterior applications and aluminum fasteners for interior applications.
3. Provide exposed fasteners with heads matching color of panel by means of plastic caps or factory-applied coating.
4. Provide metal-backed neoprene washers under heads of exposed fasteners located on weather side of panels.

D. Accessories: Unless otherwise specified, provide components required for a complete wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, seam covers, flashings, louvers, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.

1. Closure Strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or cross-linked, polyolefin-foam flexible closure strips. Cut or premold to match configuration of panels. Provide closure strips where indicated or necessary to ensure weathertight construction.
2. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
3. Joint Sealant: One-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant as recommended by panel manufacturer.

E. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat, unless otherwise indicated. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance

requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Sound Control: Where sound-absorption requirement is indicated, fabricate interior liner panels with 1/8-inch- (3-mm-) diameter holes uniformly spaced approximately 1000 holes per square foot (10 750 holes per square meter). Cover insulation with polyethylene film and provide inserts of wire mesh to form acoustical spacer grid.

C. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with substrate materials that are noncompatible or could result in corrosion or deterioration of either materials or finishes.

D. Fabricate panel joints with captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

2.8 SECONDARY FRAMING

A. Panel Supports and Anchorage: Provide girts, furring channels, angles, plates, bracing, and other secondary framing members.

1. Girts: C- or Z-shaped sections fabricated from 0.0598-inch- (1.5-mm-) thick, shop-painted, roll-formed steel.
2. Flange and Sag Bracing: 1-5/8-by-1-5/8-inch (41-by-41-mm) angles, fabricated from 0.0598-inch- (1.5-mm-) thick, shop-painted, roll-formed steel.
3. Base or Sill Angles: Fabricate from 0.079-inch- (2.0-mm-) thick, cold-formed, galvanized steel sections.
4. Secondary structural members, except columns and beams, shall be manufacturer's standard sections fabricated from 0.079-inch- (2.0-mm-) thick, cold-formed galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panel walls.

1. Panel Supports and Anchorage: Examine wall framing to verify that girts, angles, and other secondary structural panel support members and anchorage have been installed to meet requirements of panel manufacturer.
2. Do not proceed with wall panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate metal wall panels with rain drainage work; flashing; trim; and construction of soffits, roofing, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

B. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

C. Secondary Structural Supports: Install girts, angles, and other secondary structural panel support members and anchorage according to the Light Gage Structural Institute's "Guide Specifications," Section 07410, "Manufactured Roof and Wall Panels."

3.3 PANEL INSTALLATION

A. General: Comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting exterior panels by torch is not permitted.
2. Install panels with concealed fasteners.
3. Install panels with exposed exterior and interior fasteners, prefinished to match panel finishes.
4. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled, uniform compression for positive seal without rupture of neoprene washer.

B. Accessories: Install components required for a complete wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, seam covers, flashings, louvers, sealants, gaskets, fillers, closure strips, and similar items.

C. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.

1. Install weatherseal to prevent air and moisture penetration. Flash and seal panels at ends and intersections with other materials with rubber, neoprene, or other closures to exclude weather.
2. Seal panel end laps with a bead of tape or sealant, full width of panel. Seal side joints where recommended by panel manufacturer.
3. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

D. Wall Panels: Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as necessary for waterproofing. Handle and apply sealant and back-up according to sealant manufacturer's written instructions.

1. Align bottom of wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
2. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
3. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

E. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating or by other permanent separation as recommended by manufacturers of dissimilar metals.

F. Coat back side of metal panels with bituminous coating where it will contact wood, ferrous metal, or cementitious construction.

G. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.4 CLEANING AND PROTECTING

A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION 07412

SECTION 07600

SHEET METALWORK, GENERAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 167	(1993) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM B 32	(1993) Solder Metal
ASTM B 209	(1992a) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(1992a) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
ASTM D 226	(1989) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 2822	(1991) Asphalt Roof Cement
ASTM D 4586	(1993) Asphalt Roof Cement, Asbestos Free

SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA)

SMACNA-02	(1993) Architectural Sheet Metal Manual

1.2 GENERAL REQUIREMENTS

Sheet metalwork shall be accomplished to form weathertight construction without waves, warps, buckles, fastening stresses or distortion, and shall allow for expansion and contraction.

1.2.1 Coordination

Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed by sheet metal mechanics. Installation of sheet metal items used in conjunction with roofing shall be coordinated with roofing work to permit continuous roofing operations.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings

Materials; GA.

Drawings of sheet metal items showing weights, gauges or thicknesses; types of materials; expansion-joint spacing; fabrication details; and installation procedures.

SD-08 Statement Contractor Quality Control FIO.

Quality control reports, citing observations and inspections of this work, on a daily basis.

1.4 DELIVERY, STORAGE, AND HANDLING

Materials shall be adequately packaged and protected during shipment and shall be inspected for damage, dampness, and wet-storage stains upon delivery to the jobsite. Materials shall be clearly labeled as to type and manufacturer. Sheet metal items shall be carefully handled to avoid damage. Materials shall be stored in dry, ventilated areas until immediately before installation.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the requirements specified below and to the thicknesses and configurations established in SMACNA-02. Different items need not be of the same metal.

2.1.1 Accessories

Accessories and other items essential to complete the sheet metal installation, though not specifically indicated or specified, shall be provided.

2.1.2 Aluminum Extrusions

ASTM B 221, Alloy 6063, Temper T5.

2.1.3 Bituminous Cement

Type I asphalt cement conforming to ASTM D 2822 or ASTM D 4586.

2.1.4 Sealant

Unless otherwise specified, sealant shall be an elastomeric weather resistant sealant as specified in Section 07920 JOINT SEALING.

2.1.5 Fasteners

Fasteners shall be compatible with the fastened material and shall be the type best suited for the application.

2.1.6 Felt

ASTM D 226, Type I.

2.1.7 Aluminum Alloy Sheet and Plate

ASTM B 209, form, alloy, and temper appropriate for use.

2.1.8 Stainless Steel

ASTM A 167, Type 302 or 304; fully annealed, dead soft temper.

2.1.9 Solder

ASTM B 32, 95-5 tin-antimony.

PART 3 EXECUTION

3.1 GENERAL

Items such as gutters, downspouts and louvers shall be fabricated in conformance with SMACNA-02 and as indicated. Unless otherwise specified or indicated, exposed edges shall be folded back to form a 1/2 inch hem on the concealed side, and bottom edges of exposed vertical surfaces shall be angled to form drips.

3.2 EXPANSION JOINTS

Expansion joints shall be provided as specified in SMACNA-02. Expansion joints in continuous sheet metal shall be provided at 40 foot intervals stainless steel and at 32 foot intervals for aluminum, except extruded aluminum gravel stops and fasciae which shall have expansion joints at not more than 12 foot spacing. Joints shall be evenly spaced.

3.3 PROTECTION OF ALUMINUM

Aluminum that will be in contact with wet or pressure-treated wood, mortar, concrete, masonry, or ferrous metals shall be protected against galvanic or corrosive action by one of the following methods:

3.3.1 Paint

Aluminum surfaces shall be solvent cleaned and given one coat of zinc-molybdate primer and one coat of aluminum paint as specified in Section 09900 PAINTING, GENERAL.

3.3.2 Nonabsorptive Tape or Gasket

Nonabsorptive tape or gasket shall be placed between the adjoining surfaces and cemented to the aluminum surface using a cement compatible with aluminum.

3.4 CONNECTIONS AND JOINTING

3.4.1 Soldering

Soldering shall apply to stainless steel items. Edges of sheet metal shall be pretinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Edges of stainless steel to be pretinned shall be treated with soldering acid flux. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a water solution of washing soda and rinsed with clean water.

3.4.2 Riveting

Joints in aluminum sheets 0.040 inch or less in thickness shall be mechanically made.

3.4.3 Seaming

Flat-lock and soldered-lap seams shall finish not less than 1 inch wide. Unsoldered plain-lap seams shall lap not less than 3 inches unless otherwise specified. Flat seams shall be made in the direction of the flow.

3.5 CLEATS

A continuous cleat shall be provided where indicated or specified to secure loose edges of the sheet metalwork. Butt joints of cleats shall be spaced approximately 1/8 inch apart. The cleat shall be fastened to supporting wood construction with nails evenly spaced not over 12 inches on centers. Where the fastening is to be made to concrete or masonry, screws shall be used and shall be driven in expansion shields set in concrete or masonry.

3.6 FLASHINGS

3.6.1. General

Flashings shall be installed at locations indicated and as specified below. Sealing shall be according to the flashing manufacturer's recommendations. Flashings shall be installed at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof, and floor drains, and for electrical conduit projections through roof or walls are specified in other sections. Flashing shall be formed to direct water to the outside of the system.

3.6.2 Lintel Flashing

Lintel flashing shall extend the full length of lintel. Flashing shall extend through the wall one masonry course above the lintels and shall be bent down over the vertical leg of the outer steel lintel angle not less than 2 inches, or shall be applied over top of masonry and precast concrete lintels. Bedjoints of lintels at control joints shall be underlaid with sheet metal bond breaker.

3.6.3 Sill Flashing

Sill flashing shall extend the full width of the sill and not be less than 4 inches beyond ends of sill.

3.7 CONTRACTOR QUALITY CONTROL

The Contractor shall establish and maintain a quality control procedure for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following:

a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.

b. Verification of compliance of materials before, during, and after installation.

c. Inspection of sheet metalwork for proper size and thickness, fastening and joining, and proper installation.

The actual quality control observations and inspections shall be documented

and a copy of the documentation furnished to the Contracting Officer at the end of each day.

END OF SECTION 07600

SECTION 07920

JOINT SEALING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 509	(1991) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C 920	(1987) Elastomeric Joint Sealants
ASTM D 1056	(1991) Flexible Cellular Materials - Sponge or Expanded Rubber

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Backing; GA.

Bond-Breaker; GA.

Sealant; GA.

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). A copy of the Material Safety Data Sheet shall be provided for each solvent, primer or sealant material.

SD-13 Certificates

Sealant; FIO.

Certificates of compliance stating that the materials conform to the specified requirements.

1.3 ENVIRONMENTAL REQUIREMENTS

The ambient temperature shall be within the limits of 40 to 90 degrees F when the sealants are applied.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the job in the manufacturer's original unopened containers. The container label or accompanying data sheet shall include the following information as applicable: manufacturer, name of material, formula or specification number, lot number, color, date of manufacture, mixing instructions, shelf life, and curing time at the standard conditions for laboratory tests. Materials shall be handled and stored to prevent inclusion of foreign materials. Materials shall be stored at temperatures between 40 and 90 degrees F unless otherwise specified by the manufacturer.

PART 2 PRODUCTS

2.1 BACKING

Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated.

2.1.1 Rubber Backing

Cellular rubber sponge backing shall be ASTM D 1056, Type 2, closed cell, Class A, Grade SCE-41, round cross section.

2.1.2 Synthetic Rubber Backing

Synthetic rubber backing shall be ASTM C 509, Option II, Type I preformed rods or tubes.

2.2 BOND-BREAKER

Bond-breaker shall be as recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

2.3 PRIMER

Primer shall be non-staining type as recommended by sealant manufacturer for the application.

2.4 ELASTOMERIC SEALANTS

Elastomeric sealants shall conform to ASTM C 920 and the following:

a. Polysulfide Sealant, Type S or M, Grade NS, Class 12.5, Use NT, M, G, A, O.

b. Polyurethane Sealant, Grade NS, Class 12.5, Use NT, M, G, A, O.

c. Silicone Sealant, Type S or M, Grade NS, Class 12.5, Use NT, M, G, A, O.

2.5 SOLVENTS AND CLEANING AGENTS

Solvents, cleaning agents, and accessory materials shall be provided as recommended by the manufacturer.

PART 3 EXECUTION

3.1 GENERAL

3.1.1 Surface Preparation

The surfaces of joints to be sealed shall be dry. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from surfaces of joints to be in contact with the sealant. Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths.

3.1.2 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence and loose mortar shall be removed from the joint cavity.

3.1.3 Steel Surfaces

Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.

3.1.4 Aluminum Surfaces

Aluminum surfaces to be in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coating shall be as recommended by the manufacturer of the aluminum work and shall be non-staining.

3.1.5 Wood Surfaces

Wood surfaces to be in contact with sealants shall be free of splinters and sawdust or other loose particles.

3.2 APPLICATION

3.2.1 Masking Tape

Masking tape may be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

3.2.2 Backing

Backing shall be installed to provide the indicated sealant depth. The installation tool shall be shaped to avoid puncturing the backing.

3.2.3 Bond-Breaker

Bond-breaker shall be applied to fully cover the bottom of the joint without contaminating the sides where sealant adhesion is required.

3.2.4 Primer

Primer shall be used on concrete masonry units, wood, or other porous surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces adjacent to joints shall not be primed.

3.2.5 Sealant

Sealant shall be used before expiration of shelf life. Multi-component sealants shall be mixed according to manufacturer's printed instructions. Sealant in guns shall be applied with a nozzle of proper size to fit the width of joint. Joints shall be sealed as detailed in the drawings. Sealant shall be forced into joints with sufficient pressure to expel air and fill the groove solidly. Sealant shall be installed to the indicated depth without displacing the backing. Unless otherwise indicated, specified, or recommended by the manufacturer, the installed sealant shall be tooled so that the surface is uniformly smooth and free of wrinkles and to assure full adhesion to the sides of the joint. Sealants shall be installed free of air pockets, foreign embedded matter, ridges and sags. Sealer shall be applied over the sealant when and as specified by the sealant manufacturer.

3.3 CLEANING

The surfaces adjoining the sealed joints shall be cleaned of smears and other soiling resulting from the sealant application as work progresses.

END OF SECTION 07920

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

DOOR AND HARDWARE INSTITUTE (DHI)

DHI-02	(1986) Installation Guide for Doors and Hardware

STEEL DOOR INSTITUTE (SDOI)

SDOI SDI-100	(1991) Standard Steel Doors and Frames
SDOI SDI-106	(1991) Standard Door Type Nomenclature
SDOI SDI-107	(1984) Hardware on Steel Doors (Reinforcement - Application)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Steel Doors and Frames; GA

Drawings using standard door type nomenclature in accordance with SDOI SDI-106 indicating the location of each door and frame, elevation of each model of door and frame, details of construction, method of assembling sections, location and extent of hardware reinforcement, hardware locations, type and location of anchors for frames, and thicknesses of metal. Drawings shall include catalog cuts or descriptive data for the doors, frames, and manufacturers printed instructions.

1.3 DELIVERY AND STORAGE

During shipment, welded unit type frames shall be strapped together in pairs with heads at opposite ends or shall be provided with temporary steel spreaders at the bottom of each frame; and knockdown type frames shall be securely strapped in bundles. Materials shall be delivered to the site in undamaged condition, and stored out of contact with the ground and under a weathertight covering permitting air circulation. Doors and assembled frames shall be stored in an upright position in accordance with DHI-02. Abraded, scarred, or rusty areas shall be cleaned and touched up with matching finishes.

PART 2 PRODUCTS

2.1 DOORS AND FRAMES

Doors and frames shall be factory fabricated in accordance with SDOI SDI-100 and the additional requirements specified herein. Door grade shall be heavy duty (Grade II) unless otherwise indicated on the door and door frame schedules. Doors and frames shall be designation G60 galvanized. Doors and frames shall be prepared to receive hardware conforming to the templates and information provided under Section 08700 BUILDERS' HARDWARE. Doors and frames shall be reinforced, drilled, and tapped to receive mortised hinges, locks, latches, and flush bolts as required. Doors and frames shall be reinforced for surface applied hardware. Frames shall be welded type. Rubber silencers shall be furnished for installation into factory predrilled holes in door frames; adhesively applied silencers are not acceptable. Where frames are installed in masonry walls, plaster guards shall be provided on door frames at hinges and strikes. Reinforcing of door assemblies for closers and other required hardware shall be in accordance with SDOI SDI-100. Doors shall have top edges closed flush and sealed against water penetration.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall be in accordance with DHI-02. Preparation for surface applied hardware shall be in accordance with SDOI SDI-107. Rubber silencers shall be installed in door frames after finish painting has been completed. Hollow metal door frames shall be solid grouted in masonry walls.

3.2 FIELD PAINTED FINISH

Steel doors and frames shall be field painted in accordance with Section 09900 PAINTING, GENERAL. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

END OF SECTION 08110

SECTION 08510

STEEL WINDOWS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 525	(1991b) General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A 569	(1991a) Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality
ASTM B 766	(1986) Electrodeposited Coatings of Cadmium

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.6.3	(1972; R 1991) Machine Screws and Machine Screw Nuts
ASME B18.6.4	(1981; R 1991) Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws (Inch Series)

STEEL WINDOW INSTITUTE (SWI)

SWI-01	(1989) The Specifier's Guide to Steel Windows

1.2 WINDOW PERFORMANCE

Steel windows shall be designed to meet the performance requirements of the class and grade identified in the standard referenced for each particular type of window specified.

1.3 SUBMITTALS
Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300

SD-01 Data

Steel Windows; GA.

Manufacturer's descriptive data and catalog cut sheets.

SD-04 Drawings

Steel Windows; GA.

Drawings indicating elevations of windows, rough-opening dimensions for each type and size of windows, full-size sections, thicknesses of metal, fastenings, methods of installation and anchorage, connections with other work, type of wall construction, size and spacing of anchors, method of glazing, types and locations of operating hardware, mullion details, and window schedule showing location of each window type.

SD-06 Instructions

Steel Windows; FIO.

Manufacturer's preprinted installation instructions and cleaning instructions.

SD-13 Certificates

Steel Windows; FIO.

Certificates stating that the steel windows conform to requirements of this section.

1.4 DELIVERY AND STORAGE

Steel windows shall be delivered to project site and stored in accordance with manufacturer's recommendations. Damaged windows shall be replaced with new windows.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Steel Bars

Steel bars shall be solid one-piece sections hot-rolled from new billet steel in accordance with SWI-01.

2.1.2 Sheet Steel

Hot-rolled sheet steel shall conform to ASTM A 569, commercial quality with a minimum of 0.15 percent carbon. Sheet steel shall be zinc coated (galvanized) by the hot-dip process in accordance with ASTM A 525.

2.1.3 Screws and Bolts

Screws and bolts shall conform to ASTM B 766, ASME B18.6.3 and ASME B18.6.4.

2.2 STEEL WINDOW TYPES

Steel windows shall be designed for field glazing, using metal "glazing" panels as specified in SECTION 05500 MISCELLANEOUS METALS. Units shall be complete with glazing provisions to meet requirements of paragraph WINDOW PERFORMANCE and SWI-01. Glazing material shall be compatible with steel, and shall not require painting.

2.2.1 Projected Windows

Steel projected windows shall conform to SWI-01 Heavy Intermediate type. Hinges for projected windows shall be concealed four-bar friction type. Sash locks for project-out ventilators shall be cam-action sweep-lock handle with surface-mounted strike.

2.2.2 Casement Windows
Steel casement windows shall conform to SWI-01 Heavy Intermediate type, and shall have ventilators which swing on side jambs and locking devices to secure ventilators tightly in the frame in the closed position. Hinges for casement windows with rotary gear operators shall be non-friction extension type. Operating device shall be rotary gear type. Locks shall be lift type cam-action. Ventilator opening shall provide access for cleaning.

2.2.3 Single-Hung Windows
Single-Hung windows shall conform to SWI-01, Heavy intermediate type. Units shall be designed and fabricated from one-piece hot-rolled steel members to meet glass sizes, window sizes and opening dimensions. Sash control for raising and holding sash in the open position shall be by adjustable spiral balances.

2.3 ACCESSORIES

2.3.1 Fasteners

Fastening devices shall be window manufacturer's standard design made from non-magnetic stainless steel, cadmium-plated steel, zinc-plated steel, nickel/chrome-plated steel or magnetic stainless steel in compliance with SWI-01. Self-tapping sheet metal screws are not acceptable for material thicker than 1/16 inch.

2.3.2 Window Anchors
Anchors for installing windows shall be stainless steel or hot-dip zinc coated steel conforming to ASTM A 123, except wood shear pins shall be used at each window where so noted.

2.4 FINISHES

2.4.1 Galvanized Finish
Steel windows and associated parts shall be hot-dip galvanized in accordance with ASTM A 123. Apply factory primer, compatible with galvanized coating, ready to receive field painting as specified in

PART 3 EXECUTION

3.1 INSTALLATION
Steel windows shall be installed in accordance with approved shop drawings and manufacturer's approved recommendations. Steel surfaces in close proximity with masonry, concrete, wood, and dissimilar metals other than stainless steel, zinc, cadmium, or small areas of white bronze shall be protected from direct contact. The completed window installation shall be watertight and shall be in accordance with Section 07920, CAULKING AND SEALING.

3.2 ADJUSTMENTS AND CLEANING

3.2.1 Hardware Adjustments
Final operating adjustments shall be made after glazing work is complete. When adjustments are completed, operating sash or ventilators shall operate smoothly, and shall be weathertight when locked in closed position.
3.2.2 Cleaning
Steel window finish and metal grazing panels shall be cleaned on interior and exterior sides in accordance with window manufacturer's recommendations. Alkaline or abrasive agents shall not be used.

3.3 FIELD-PAINTED FINISH
Steel windows shall be field-painted in accordance with Section 09900, PAINTING, GENERAL. Finish shall be free of scratches and other blemishes. Color shall be in accordance with Section 09915, COLOR SCHEDULE.

END OF SECTION 08510

SECTION 08520

ALUMINUM WINDOWS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF-45	(1980) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 101	(1993) Voluntary Specifications for Aluminum Prime Windows and Sliding Glass Doors

1.2 WINDOW PERFORMANCE

Aluminum windows shall be designed to meet the performance requirements of the class and grade identified in the standard referenced for the particular type of window specified.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Aluminum Windows; GA

Manufacturer's descriptive data and catalog cut sheets.

SD-04 Drawings

Aluminum Windows; GA

Drawings indicating elevations of window, rough-opening dimensions for each type and size of window, full-size sections, thicknesses of metal, fastenings, methods of installation and anchorage, connections with other work, type of wall construction, size and spacing of anchors, method of glazing, types and locations of operating hardware and window schedules showing locations of each window type.

SD-06 Instructions
Aluminum Windows; FIO

Manufacturer's preprinted installation instructions and cleaning instructions.

SD-13 Certificates

Aluminum Windows; FIO

Certificates stating that the aluminum windows are AAMA certified conforming to requirements of this section. Labels or markings permanently affixed to the window will be accepted in lieu of certificates.

1.4 DELIVERY AND STORAGE

Aluminum windows shall be delivered to project site and stored in accordance with manufacturer's recommendations. Damaged windows shall be replaced with new windows.

PART 2 PRODUCTS

2.1 ALUMINUM WINDOW TYPES

2.1.1 Horizontal-Sliding Windows

Aluminum horizontal windows shall conform to AAMA 101 HS-C20 type consisting of sliding sash and fixed lite. Sash guides shall be nylon wheels.

2.2 ACCESSORIES

2.2.1 Fasteners

Fastening devices shall be window manufacturer's standard design made from aluminum, non-magnetic stainless steel, cadmium-plated steel, nickel/chrome-plated steel or magnetic stainless steel in compliance with AAMA 101. Self-tapping sheet metal screws will not be acceptable for material thicker than 1/16 inch.

2.2.2 Hardware

Hardware shall be as specified for each window type and shall be fabricated of aluminum, stainless steel, cadmium-plated steel, zinc-plated steel or nickel/chrome-plated steel of quality established by AAMA 101.

2.2.3 Window Anchors

Anchoring devices for installing windows shall be made of aluminum, cadmium-plated steel, stainless steel, or zinc-plated steel conforming to AAMA 101.

2.3 GLASS AND GLAZING

Aluminum windows shall be designed for inside glazing, field glazing, and for glass types scheduled on drawings and specified in Section 08810 GLASS AND GLAZING. Units shall be complete with glass and glazing provisions to meet AAMA 101. Glazing material shall be compatible with aluminum, and shall not require painting.

2.4 FINISH

2.4.1 Anodized Aluminum Finish

Exposed surfaces of aluminum window shall be finished with anodic coating conforming to AA DAF-45: Architectural Class II, AA-M10-C22-A31, clear anodic coating, 0.4 to 0.7 mil thick, 204-R1 Natural Color. Finish shall be free of scratches and other blemishes.

PART 3 EXECUTION

3.1 INSTALLATION

Aluminum windows shall be installed in accordance with approved shop drawings and manufacturer's published instructions. Aluminum surfaces in contact with masonry, concrete, wood and dissimilar metals other than stainless steel, zinc, cadmium or small areas of white bronze, shall be protected from direct contact using protective materials recommended by AAMA 101. The completed window installation shall be watertight in accordance with Section 07920 JOINT SEALING. Glass and glazing shall be installed in accordance with requirements of this section and Section 08810 GLASS AND GLAZING.

3.2 ADJUSTMENTS AND CLEANING

3.2.1 Hardware Adjustments

Final operating adjustments shall be made after glazing work is complete. Operating sash shall operate smoothly and shall be weathertight when in locked position.

3.2.2 Cleaning

Aluminum window finish and glass shall be cleaned in accordance with window manufacturer's recommendations. Alkaline or abrasive agents shall not be used. Precautions shall be taken to avoid scratching or marring window finish and glass surfaces.

END OF SECTION 08520

SECTION C-08700

BUILDERS' HARDWARE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 283	(1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
ASTM F 883	(1990) Padlocks

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA-01	(Effective thru Jun 1993) Directory of Certified Locks & Latches
BHMA-02	(Effective thru Jul 1993) Directory of Certified Door Closers
BHMA A156.1	(1988) Butts and Hinges
BHMA A156.3	(1989) Exit Devices
BHMA A156.4	(1986) Door Controls - Closers
BHMA A156.6	(1986) Architectural Door Trim
BHMA A156.7	(1988) Template Hinge Dimensions
BHMA A156.13	(1987) Mortise Locks & Latches
BHMA A156.16	(1989) Auxiliary Hardware
BHMA A156.18	(1987) Materials and Finishes
BHMA A156.20	(1989) Strap and Tee Hinges and Hasps
BHMA A156.21	(1989) Thresholds

DOOR AND HARDWARE INSTITUTE (DHI)

DHI-02	(1986) Installation Guide for Doors and Hardware

DHI-03	(1989) Keying Systems and Nomenclature
DHI-05	(1990) Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames
DHI A115-W	(1988) Wood Door Hardware Standards (Incl A115-W1 thru A115-W9)

FEDERAL STANDARDS (FED-STD)

FED-STD 795	(Basic) Uniform Federal Accessibility Standards

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(1990) Fire Doors and Windows
NFPA 101	(1991) Safety to Life from Fire in Buildings and Structures
NFPA 105	(1989; Int Am 89-1) Installation of Smoke- and Draft-Control Door Assemblies

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section C-01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Hardware and Accessories; GA

Manufacturer's descriptive data, technical literature, catalog cuts, and installation instructions. Spare parts data for locksets, exit devices, closers, release devices, after approval of the detail drawings, and not later than 3 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-07 Schedules

Hardware Schedule; GA

Hardware schedule listing all items to be furnished. The schedule shall include for each item: the quantities; manufacturer's name and catalog numbers; sizes; detail information or catalog cuts; finishes; door and frame size and materials; location and hardware set identification cross-references to drawings; corresponding reference standard type number or function number from manufacturer's catalog if not covered by ANSI or BHMA; and list of abbreviations and template numbers.

Keying Schedule; GA.

Keying schedule developed in accordance with DHI-03, after the keying meeting with the user.

SD-13 Certificates

Hardware and Accessories; FIO

The material supplier's or hardware manufacturer's certificates of compliance stating that the supplied material or hardware item meets specified requirements. Each certificate shall be signed by an official authorized to certify in behalf of material supplier or product manufacturer and shall identify quantity and date or dates of shipment or delivery to which the certificates apply. A statement that the proposed hardware items appear in BHMA-01 and BHMA-02 directories of certified products may be submitted in lieu of certificates. A separate Certificate of Compliance attesting that hardware items conform to the "Buy American Act" shall be included.

SD-19, Operation and Maintenance Manuals

Hardware and Accessories; FIO

Six complete copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides.

1.3 DELIVERY, STORAGE, AND HANDLING

Hardware shall be delivered to the project site in the manufacturer's original packages. Each article of hardware shall be individually packaged in the manufacturer's standard commercial carton or container, and shall be properly marked or labeled to be readily identifiable with the approved hardware schedule. Each change key shall be tagged or otherwise identified with the door for which its cylinder is intended. Where double cylinder functions are used or where it is not obvious which is the key side of a door, appropriate instructions shall be included with the lock and on the hardware schedule. Manufacturer's printed installation instructions, fasteners, and special tools shall be included in each package.

1.4 SPECIAL TOOLS

Special tools, such as those supplied by the manufacturer, spanner and socket wrenches, and dogging keys, shall be provided as required to adjust hardware items.

PART 2 PRODUCTS

2.1 GENERAL HARDWARE REQUIREMENTS

Hardware shall conform to the requirements specified herein and the HARDWARE SETS listing at the end of this section. Hardware set numbers correspond to the set numbers shown on the drawings. Hardware items providing accessibility and usability for physically handicapped shall comply with FED-STD 795

2.2 TEMPLATES

Requirements for hardware to be mounted on metal doors or metal frames shall be coordinated between hardware manufacturer and door or frame manufacturer by use of templates and other information to establish location, reinforcement

required, size of holes, and similar details. Templates of hinges shall conform to BHMA A156.7.

2.3 HINGES

Hinges shall conform to BHMA A156.1. Hinges used on metal doors and frames shall also conform to BHMA A156.7. Except as otherwise specified, hinge sizes shall conform to the hinge manufacturer's printed recommendations.

2.3.1 Hinges for Reverse Bevel Doors with Locks

Hinges for reverse bevel doors with locks shall have pins that are made nonremovable by means such as a set screw in the barrel, or safety stud, when the door is in the closed position.

2.3.2 Contractor's Option

Hinges with antifriction bearings may be furnished in lieu of ball bearing hinges, except where prohibited for fire doors by the requirements of NFPA 80.

2.4 LOCKS AND LATCHES

To the maximum extent possible, locksets, latchsets and deadlocks shall be the products of a single manufacturer. Lock fronts for double-acting doors shall be rounded. Strikes for wood frames and pairs of wood doors shall be furnished with wrought boxes. Lock and latch set trim (knobs, handles, roses and escutcheons) shall be of a simple design in accordance with manufacturer's standard practice. Knob diameter shall be 2-1/8 to 2-l/4 inches.

2.4.1 Mortise Lock and Latchsets

Mortise lock, latchsets, and strikes shall be series 1000 and shall conform to BHMA A156.13, operational Grade 1. Strikes for security doors shall be rectangular without curved lip. Mortise type locks and latches for doors 1-3/4 inches thick and over shall have adjustable bevel fronts or otherwise conform to the shape of the door. Mortise locks shall have armored fronts.

2.4.2 Lock Cylinders (Mortise, Rim and Bored)

Lock cylinders shall comply with BHMA A156.5. Lock cylinder shall have not less than six pins. Cylinders shall have key removable type cores. A great grand master keying system shall be provided. Construction interchangeable cores shall be provided. Disassembly of knob or lockset shall not be required to remove core from lockset. All locksets, exit devices, and padlocks shall accept same interchangeable cores.

2.4.3 Padlocks

Padlocks shall conform to ASTM F 883. Straps, tee hinges, and hasps shall conform to BHMA A156.20.

2.4.4 Lock Trim

Lock trim shall be cast, forged, or heavy wrought construction of commercial plain design. In addition to meeting the test requirement of BHMA A156.2 or BHMA A156.13, knobs, roses, and escutcheons shall be 0.050 inch thick, if unreinforced. If reinforced, the outer shell shall be 0.035 inch thick and the combined thickness shall be 0.070 inch except that knob shanks shall be 0.060 inch thick.

2.5 EXIT DEVICES AND EXIT DEVICE ACCESSORIES

Exit devices and exit device accessories shall conform to BHMA A156.3, Grade 1.

2.5.1 Exit Devices and Auxiliary Items

Trim shall be of wrought construction and commercial plain design with straight, beveled, or smoothly rounded sides, corners, and edges. Adjustable strikes shall be provided for rim type and vertical rod devices. Open back strikes shall be provided for pairs of doors with mortise and vertical rod devices; except open back strikes shall be used on labeled doors only where specifically provided for in the published listings. Touch bars shall be provided in lieu of conventional crossbars and arms. Escutcheons shall be provided not less than 7 by 2-1/4 inches. Escutcheons will be cut to suit cylinders and operating trim.

2.6 KEYING

Locks shall be keyed in sets or subsets as scheduled. Locks shall be furnished with the manufacturer's standard construction key system. Change keys for locks shall be stamped with change number and the inscription "U.S. Property - Do Not Duplicate." Keys shall be supplied as follows:

Locks:	2 change keys each lock.
Master keyed sets:	3 keys each set.
Grand master keys:	3 total.
Construction keys:	4 total.

The keys shall be furnished to the Contracting Officer arranged in sets or subsets as scheduled and submit a bitting list prior to project completion.

2.7 DOOR CLOSING DEVICES

Door closing devices shall conform to BHMA A156.4, Grade 1. Closing devices shall be products of one manufacturer for each type specified.

2.7.1 Surface Type Closers

Surface type closers shall be Grade 1, Series C02000 Full Cover with options PT-4H, Size 1 or 2 through Size 6, and PT-4D with back check position valve. Except as otherwise specified, sizes shall conform to the manufacturer's published recommendations. Closers for outswinging exterior doors shall have parallel arms or shall be top jamb mounted. Closers for doors close to a wall shall be of narrow projection so as not to strike the wall at the 90-degree open position.

2.8 ARCHITECTURAL DOOR TRIM

Architectural door trim shall conform to BHMA A156.6.

2.8.1 Door Protection Plates

2.8.1.1 Kick Plates

Kick plates shall be Category J100, stainless steel. Width of plates shall be 2 inches less than door width for single doors and 1 inch less for pairs of doors. Height shall be 16 inches.

2.9 MISCELLANEOUS

2.9.1 Metal Thresholds

Thresholds shall conform to BHMA A156.21. Thresholds for exterior doors shall be extruded aluminum of the type indicated and shall provide proper clearance and an effective seal with specified weather stripping. Thresholds for doors accessible to the handicapped shall be beveled with slopes not exceeding 1:2 and with heights not exceeding 1/2 inch.

2.10 FASTENINGS

Fastenings of proper type, size, quantity, and finish shall be supplied with each article of hardware. Machine screws and expansion shields shall be used for attaching hardware to concrete or masonry. Fastenings exposed to the weather in the finished work shall be of brass, bronze, or stainless steel. Sex bolts, through bolts, or machine screws and grommet nuts, where used on reverse-bevel exterior doors equipped with half-surface or full-surface hinges, shall employ one-way screws or other approved tamperproof screws. Screws for the jamb leaf of half-mortise and full-surface hinges attached to structural steel frames shall be one-way or other approved tamperproof type.

2.11 FINISHES

Unless otherwise specified, finishes shall conform to those identified in BHMA A156.18. Where painting of primed surfaces is required, painting is specified in Section C-09900 PAINTING, GENERAL.

2.12 HARDWARE FOR FIRE DOORS

Hardware for fire doors shall conform to the requirements of NFPA 80 and NFPA 101.

PART 3 EXECUTION

3.1 APPLICATION

Hardware shall be located in accordance with DHI-04 and DHI-05. When approved, slight variations in locations or dimensions will be permitted. Application shall be in accordance with DHI-02 or DHI A115-W. Door control devices for exterior doors such as closers and holders, shall normally attach to doors with thru bolts and nuts or sex bolts. Electric hardware items and access control devices shall be installed in accordance with manufacturer's printed installation procedures.

3.1.1 Hardware for Fire Doors and Smoke-Control Door Assemblies

Hardware for fire doors shall be installed in accordance with the requirements of NFPA 80. Exit devices installed on fire doors shall have a visible label bearing the marking "Fire Exit Hardware". Other hardware installed on fire doors, such as locksets, closers, and hinges shall have a visible label or stamp indicating that the hardware items have been approved by an approved testing agency for installation on fire-rated doors. Hardware for smoke-control door assemblies shall be installed in accordance with NFPA 105.

3.1.2 Door-Closing Devices

Door-closing devices shall be installed and adjusted in accordance with the templates and printed instructions supplied by the manufacturer of the

devices. Insofar as practicable, doors opening to or from halls and corridors shall have the closer mounted on the room side of the door.

3.1.3 Kick Plates and Mop Plates

Kick plates shall be installed on the push side of single-acting doors and on both sides of double-acting doors. Mop plates shall be installed on the pull side of the single acting doors.

3.1.4 Thresholds

Thresholds shall be secured with a minimum of 3 fasteners per single door width and 6 fasteners per double door width with a maximum spacing of 12 inches. Exterior thresholds shall be installed in a bed of sealant with expansion anchors and stainless steel screws, except that bronze or anodized bronze thresholds shall be installed with expansion anchors with brass screws. Minimum screw size shall be No. 10 length, dependent on job conditions, with a minimum of 3/4-inch thread engagement into the floor or anchoring device used.

3.2 HARDWARE SETS

HW-1 DOORS NO. 1 & 3
EACH DOOR TO HAVE

3 EA.	HINGES A5111 4-1/2 X 4-1/2 NRP	630
1 EA.	LOCKSET, F04, GRADE 1	630
1 EA.	CLOSER, C02021	689
1 EA.	KICKPLATE J102	630
1 SET	WEATHER STRIP DURABLE 305	AL
1 EA.	THRESHOLD DURABLE C205	AL

HW-2 DOORS NO. 2 & 4
EACH DOOR TO HAVE

3 EA.	HINGES A5111 4-1/2 X 4-1/2 NRP	630
1 EA.	EXIT DEVICE, TYPE 3, FUNCTION 08, GRADE 1	630
1 EA.	CLOSER, C02011	689
1 EA.	KICKPLATE J102	630
1 EA.	DOOR STOP L02251	630

HW-3 DOORS NO. 5 & 6
EACH DOOR TO HAVE

2 EA.	HINGES A5111 4-1/2 X 4-1/2	630
1 EA.	LATCHSET, F01, GRADE 1	630
1 EA.	DOOR STOP L02251	630

HW-4 DOORS NO. 7
EACH DOOR TO HAVE

2 EA.	HINGES A5111 4-1/2 X 4-1/2	630
1 EA.	LOCKSET, F07, GRADE 1	630

HW-5 DOORS NO. 8 & 9
EACH DOOR TO HAVE

1 EA.	CONTINUOUS HINGE FM 300 X 2-1/2	630

BALANCE OF HARDWARE IS SHOWN ON DRAWING DETAIL

SECTION 08810

GLASS AND GLAZING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 920	(1987) Elastomeric Joint Sealants
ASTM C 1036	(1991) Flat Glass
ASTM C 1172	(1991) Laminated Architectural Flat Glass
ASTM D 395	(1989) Rubber Property - Compression Set

CODE OF FEDERAL REGULATIONS (CFR)

16 CFR 1201	Safety Standard for Architectural Glazing Materials

FLAT GLASS MARKETING ASSOCIATION (FGMA)

FGMA-01	(1990) Glazing Manual

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Glass; GA. Glazing Accessories; GA.

Manufacturer's descriptive product data, handling and storage recommendations, installation instructions, and cleaning instructions.

SD-04 Drawings

Glazing Materials and Accessories; GA.

Drawings showing complete details of the proposed setting methods, mullion details, edge blocking, size of openings, frame details, materials, and types and thickness of glass.
Drawing showing complete details of the proposed setting methods and materials.

SD-13 Certificates

Glass; FIO.

Certificates stating that the glass meets the specified requirements. Labels or marking affixed to the glass will be accepted in lieu of certificates.

1.3 SYSTEM DESCRIPTION

Glazing systems shall be fabricated and installed watertight and airtight to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, and defects in the work.

1.4 DELIVERY, STORAGE AND HANDLING

Glazing compounds shall be delivered to the site in the manufacturer's unopened containers. Glass shall be stored indoors in a safe, well ventilated dry location in accordance with manufacturer's instructions, and shall not be unpacked until needed for installation. Glass shall not be stored on site over 1 month.

1.5 PROJECT/SITE CONDITIONS

Glazing work shall not be started until outdoor temperature is above 40 degrees F and rising, unless procedures recommended by glass manufacturer and approved by Contracting Officer are made to warm the glass and rabbet surfaces. Glazing work shall not be performed during damp or raining weather.

PART 2 PRODUCTS

2.1 LAMINATED GLASS

Laminated glass shall consist of two layers of Type I transparent float glass, Class 1-clear Quality q5 - glazing B, conforming to ASTM C 1036. Glass shall be bonded together with 0.015 inch thick PVB plastic interlayer under pressure, conforming to requirements of 16 CFR 1201 and ASTM C 1172.

2.2 GLAZING ACCESSORIES

2.2.1 Preformed Tape

Preformed tape shall be elastomeric rubber extruded into a ribbon of a width and thickness suitable for specific application. Tape shall be of type which will remain resilient, have excellent adhesion, and be chemically compatible to glass, metal, or wood.

2.2.2 Sealant

Sealant shall be elastomeric conforming to ASTM C 920, Type S or M, Grade NS, Class 12.5, Use G, of type chemically compatible with setting blocks and preformed sealing tape Color of sealant shall be shown in Section 09915 COLOR SCHEDULE.

2.2.3 Setting and Edge Blocking

Neoprene setting blocks shall be dense extruded type conforming to ASTM D 395, Method B, Shore A durometer between 70 and 90. Edge blocking shall be Shore A durometer of 50 (+ or - 5). Silicone setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

Openings and framing systems scheduled to receive glass shall be examined for compliance with approved shop drawings, FGMA-01 and glass manufacturer's recommendations including size, squareness, offsets at corners, face and edge clearance requirements and effective sealing between joints of glass-framing members. Detrimental materials shall be removed from glazing rabbet and glass surfaces and wiped dry with solvent. Glazing surfaces shall be dry and free of frost.

3.2 INSTALLATION

Glass and glazing work shall be performed in accordance with approved shop drawings, FGMA-01, glass manufacturer's instructions and warranty requirements. Glass shall be installed with factory labels intact and removed only when instructed. Edges and corners shall not be ground, nipped or cut after leaving factory. Springing, forcing or twisting of units during installation will not be permitted.

3.3 CLEANING

Upon completion of project, outside surfaces of glass shall be washed clean and the inside surfaces of glass shall be washed and polished in accordance with glass manufacturer's recommendations.

3.4 PROTECTION

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

END OF SECTION 08810

SECTION 09900

PAINTING, GENERAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH-02	(1991) 1991-1992 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3273	(1986; R 1991) Resistance to Growth of Mold on the Surface of Interior Coating in an Environmental Chamber
ASTM D 3274	(1982; R 1988) Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation
ASTM D 4214	(1989) Evaluating the Degree of Chalking of Exterior Paint Films

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1500	(Rev A) Sealer, Surface (Latex Block Filler)
CID A-A-1550	(Basic) Wax, General Purpose, Solvent Type

FEDERAL SPECIFICATIONS (FS)

FS TT-E-489	(Rev H) Enamel, Alkyd, Gloss, Low VOC Content
FS TT-E-506	(Rev K; Am 1) Enamel, Alkyd, Gloss, Tints and White (for Interior Use)
FS TT-E-508	(Rev C; Am 1) Enamel, Interior Semigloss, Tints and White

FS TT-E-509	(Rev C) Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints
FS TT-E-545	(Rev C) Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White)
FS TT-P-19	(Rev D; Am 1) Paint, Latex (Acrylic Emulsion, Exterior Wood and Masonry)
FS TT-P-30	(Rev E; Am 1) Paint, Alkyd, Odorless, Interior, Flat, White and Tints
FS TT-P-37	(Rev D; Am 4 Reinstatement Notice) Paint, Alkyd Resin: Exterior Trim, Deep Colors
FS TT-P-38	(Rev E) Paint, Aluminum (Ready-Mixed)
FS TT-P-102	(Rev F) Paint, Oil, (Alkyd Modified, Exterior, Low VOC)
FS TT-P-645	(Rev B) Primer, Paint, Zinc-Molybdate, Alkyd Type
FS W-110	(Rev C) Water Repellent, Colorless Silicone Base

FEDERAL STANDARDS (FED-STD)

FED-STD 313	(Rev C) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities
FED-STD 595	(Rev B) Colors Used in Government Procurement

MILITARY SPECIFICATIONS (MS)

MS MIL-P-26915	(Rev C) Primer Coating, Zinc Dust Pigmented, for Steel Surfaces
MS MIL-P-28582	(Basic; Notice 1) Primer Coating, Exterior, Lead Pigment-Free (Undercoat for Wood, Ready-Mixed, White and Tints)
MS MIL-S-12935	(Rev D) Sealer, Surface; for Knots

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 5	(1991) Zinc Dust, Zinc Oxide and Phenolic Varnish Paint

SSPC Paint 21	(1991) White or Colored Silicone Alkyd Paint
SSPC Paint 25	(1991) Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (without Lead and Chromate Pigments)
SSPC SP 1	(1982) Solvent Cleaning
SSPC SP 2	(1989) Hand Tool Cleaning
SSPC SP 3	(1989) Power Tool Cleaning
SSPC SP 7	(1991) Brush-Off Blast Cleaning

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Paint; FIO.

The names, quantity represented, and intended use for the proprietary brands of materials proposed to be substituted for the specified materials when the required quantity of a particular batch is 200 L (50 gallons) or less.

SD-06 Instructions

Mixing and Thinning; FIO. Application; FIO.

Manufacturer's current printed product description, material safety data sheets (MSDS) and technical data sheets for each coating system. MSDS submittals shall meet the requirements of FED-STD 313. Detailed mixing, thinning and application instructions, minimum and maximum application temperature, and curing and drying times between coats.

SD-13 Certificates

Lead; FIO. Mildewcide and Insecticide; FIO.
Volatile Organic Compound (VOC) Content; FIO.

Certificate stating that paints for interior use contain no mercurial mildewcide or insecticide. Certificate stating that paints proposed for use contain not more than 0.06 percent lead. Certificate stating that paints proposed for use meet the VOC regulations of the local Air Pollution Control Districts having jurisdiction over the geographical area in which the project is located.

1.3 PACKAGING, LABELING, AND STORING

Paints shall be in sealed containers that legibly show the designated name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints and thinner shall be stored in accordance with the manufacturer's written directions and as a minimum stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors and at temperatures between 40 and 95 degrees F. Paints shall be stored on the project site or segregated at the source of supply sufficiently in advance of need to allow 30 days for testing.

1.4 APPROVAL OF MATERIALS

Materials will be approved based on test reports furnished with them. If materials are approved based on test reports furnished, samples will be retained by the Government for testing should the materials appear defective during or after application. In addition to any other remedies under the contract the cost of retesting defective materials will be at the Contractor's expense.

1.5 ENVIRONMENTAL CONDITIONS

Unless otherwise recommended by the paint manufacturer, the ambient temperature shall be between 45 and 95 degrees F.

1.6 SAFETY AND HEALTH

Work shall comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in the CONTRACT CLAUSES. The Activity Hazard Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.6.1 Worker Exposures

Exposure of workers to chemical substances shall not exceed limits as established by ACGIH-02, or as required by a more stringent applicable regulation.

1.6.2 Toxic Compounds

Toxic compounds having ineffective physiological properties, such as odor or irritation levels, shall not be used unless approved by the Contracting Officer.

1.6.3 Training

Workers having access to an affected work area shall be informed of the contents of the applicable material data safety sheets (MSDS) and shall be informed of potential health and safety hazard and protective controls

associated with materials used on the project. An affected work area is one which may receive mists and odors from the painting operations. Workers involved in preparation, painting and clean-up shall be trained in the safe handling and application, and the exposure limit, for each material which the worker will use in the project. Personnel having a need to use respirators and masks shall be instructed in the use and maintenance of such equipment.

1.6.4 Coordination

Work shall be coordinated to minimize exposure of building occupants, other Contractor personnel, and visitors to mists and odors from preparation, painting and clean-up operations.

PART 2 PRODUCTS

2.1 PAINT

The term "paint" as used herein includes emulsions, enamels, paints, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate, or finish coat. Paint shall conform to the respective specifications listed for use in the painting schedules at the end of this section, except when the required amount of a material of a particular batch is 50 gallons or less, an approved first-line proprietary paint material with similar intended usage and color to that specified may be used. Additional requirements are as follows:

2.1.1 Colors and Tints

Colors shall be as selected from FED-STD 595. The color of the undercoats shall vary slightly from the color of the next coat. See Section 09915 for color selections.

2.1.2 Mildewcide and Insecticide

Paint specified for all coats applied to wood and masonry surfaces shall contain a mildewcide that will not adversely affect the color, texture, or durability of the coating. The mildewcide shall be incorporated into the paint by the manufacturer and shall attain a surface disfigurement rating of 8 or greater when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Insecticides shall not be used in paint.

2.1.3 Lead

Paints containing lead in excess of 0.06 percent by weight of the total nonvolatile content (calculated as lead metal) shall not be used.

2.1.4 Chromium

Paints containing zinc chromate or strontium chromate pigments shall not be used.

2.1.5 Volatile Organic Compound (VOC) Content

Paints shall comply with applicable state and local laws enacted to insure compliance with Federal Clean Air Standards and shall conform to the restrictions of the local air pollution control authority.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS NOT TO BE PAINTED

Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Items removed prior to painting shall be replaced when painting is completed. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Surfaces contaminated by coating materials shall be restored to original condition.

3.2 SURFACE PREPARATION

Surfaces to be painted shall be clean and free of foreign matter before application of paint or surface treatments. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces.

3.2.1 Concrete and Masonry Surfaces

Concrete and masonry surfaces shall be allowed to dry at least 30 days before painting, except concrete slab on grade which shall be allowed to cure 90 days before painting. Glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of free iron and other foreign matter shall be removed prior to painting. Surfaces to receive coatings shall be acid-etched or mechanically abraded as specified by the coating manufacturer, rinsed with water, allowed to dry, and treated with the manufacturer's recommended conditioner prior to application of the first coat.

3.2.2 Ferrous Surfaces

Ferrous surfaces including those that have been shop-coated, shall be solvent-cleaned. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be cleaned mechanically with hand tools according to SSPC SP 2, power tools according to SSPC SP 3 or by sandblasting according to SSPC SP 7. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

3.2.3 Nonferrous Metallic Surfaces

Galvanized, aluminum and aluminum-alloy, and other nonferrous metal surfaces shall be solvent-cleaned in accordance with SSPC SP 1.

3.2.4 Wood Surfaces

Wood surfaces shall be cleaned of foreign matter. Small, dry seasoned knots shall be scraped, cleaned, and given a thin coat of knot sealer, MS MIL-S-12935, before application of the priming coat. Pitch on large, open, unseasoned knots and all other beads or streaks of pitch shall be scraped off, or, if it is still soft, removed with mineral spirits or turpentine, and the resinous area shall be thinly coated with knot sealer.

Finishing nails shall be set, and all holes and surface imperfections shall be primed. After priming, holes and imperfections in finish surfaces shall be filled with putty or plastic wood filler, colored to match the finish coat if natural finish is required, allowed to dry, and sanded smooth. Putty or wood

filler shall be compatible with subsequent coatings. Moisture content of the wood shall not exceed 12 percent as measured by a moisture meter, unless otherwise authorized.

3.2.5 Previously Painted Surfaces

Previously painted surfaces damaged during construction shall be thoroughly cleaned of all grease, dirt, dust or other foreign matter. Blistering, cracking, flaking and peeling or other deteriorated coatings shall be removed. Slick surfaces shall be roughened. Damaged areas shall be repaired with suitable material to match adjacent undamaged areas. Edges of chipped paint shall be feather edged and sanded smooth. Rusty metal surfaces shall be cleaned as per SSPC requirements. Solvent, mechanical, or chemical cleaning methods shall be used to provide surfaces suitable for painting. Chalk shall be removed so that when tested in accordance with ASTM D 4214, the chalk resistance rating is no less than 8. New, proposed coatings shall be compatible with existing coatings. If existing surfaces are glossy, the gloss shall be reduced.

3.3 MIXING AND THINNING

When thinning is approved as necessary to suit surface, temperature, weather conditions, or application methods, paints may be thinned in accordance with the manufacturer's directions. When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed local limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

3.4 APPLICATION

Painting practices shall comply with applicable state and local laws enacted to insure compliance with Federal Clean Air Standards. Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application. Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete. Rollers for applying

paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

3.4.1 Ventilation

Affected areas shall be ventilated during paint application so that workers exposure to chemical substances shall not exceed limits as established by ACGIH-02, or as required by a more stringent applicable regulation. Interior work zones shall be ventilated at a minimum of 2 air exchanges per hour. Solvent vapors shall be exhausted outdoors, away from workers.

3.4.2 Respirators

Operators and personnel in the vicinity of operating paint sprayers shall wear respirators.

3.4.3 First Coat

The first coat shall include repeated touching up of suction spots or overall application of primer or sealer to produce uniform color and gloss. Excess sealer shall be wiped off after each application. Glazed sashes shall be given the specified coating system within 3 weeks of the time they are glazed, but not before the glazing material has set; paint shall overlay glass about 70 mils all around.

3.4.4 Timing

Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface. Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit weather conditions. Oil-based or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause the undercoat to lift or lose adhesion.

3.4.5 Fillers

Masonry surface voids shall be filled; however, surface irregularities need not be completely filled. The dried filler shall be uniform and free of pinholes. Filler shall not be applied over caulking compound.

3.4.5.1 Solvent-Thinned Filler

Solvent-thinned filler, FS TT-F-1098, shall be applied to dry surfaces only and may be applied by brush or roller. Filler shall be allowed to set for 3 to 5 minutes or until the filler becomes tacky, and the excess

material shall then be removed with a rubber squeegee. Surface voids shall be filled; however, surface irregularities need not be completely filled. Surfaces to which solvent-thinned filler has been applied shall be given the specified topcoat as soon as practical but before the filler material starts to discolor or chalk.

3.4.6 Ferrous-Metal Primer

Primer for ferrous-metal shall be applied to ferrous surfaces to receive paint prior to deterioration of the prepared surface. The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.

3.5 PIPE COLOR CODE MARKING

Pipes in exposed areas and in accessible pipe spaces shall be provided with color band and titles adjacent to all valves, at not more than 40 foot spacing on straight pipe runs, adjacent to change in direction, and on both sides where pipes pass through walls or floors. Color code marking shall be of the color listed in TABLE I and the size listed in TABLE II. The arrows shall be installed adjacent to each band to indicate the direction of flow in the pipe. The legends shall be printed in upper-case black letters as listed in TABLE I. Letter sizes shall be as listed in TABLE II. Marking shall be painted or applied using colored, pressure-sensitive adhesive markers of standard manufacture. Paint shall be as specified for insulated and uninsulated piping.

TABLE I. COLOR CODES FOR MARKING PIPE

Material	Band	Letters and Arrow*	Legend
Fire protection water	Red	White	FIRE PR.
LP gas	Blue	White	LP GAS

* In direction of flow

TABLE II. COLOR CODE MARKING SIZES

Outside Diameter of Pipe Covering (Inches)	Length of Color Band (inches)	Arrow Length x Width (Inches)	Size of Legend Letters and Numerals (Inches)
Less than 1-1/2	8	8 x 2-1/4	1/2
1-1/2 to 2-3/8	8	8 x 2-1/4	3/4
2-1/2 to 7-7/8	12	8 x 2-1/4	1-1/4
8 to 10	24	12 x 4-1/2	2-1/2
Over 10	32	12 x 4-1/2	3-1/2

3.6 MISCELLANEOUS PAINTING

3.6.1 Lettering

Lettering shall be provided as scheduled on the drawings, shall be block

type, and shall be black enamel, unless otherwise noted. Samples shall be approved before application.

3.7 SURFACES TO BE PAINTED

Surfaces listed in the painting schedules at the end of this section, other than those listed in paragraph SURFACES NOT TO BE PAINTED, shall be painted as scheduled.

3.8 SURFACES NOT TO BE PAINTED

The airframe, surfaces of hardware, fittings, and other factory finished items shall not be painted.

3.9 CLEANING

Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint and other deposits on adjacent surfaces shall be removed and the entire job left clean and acceptable.

3.10 PAINTING SCHEDULES

The following painting schedules identify the surfaces to be painted and prescribe the paint to be used and the number of coats of paint to be applied. Contractor options are indicated by ------or------ between optional systems or coats.

EXTERIOR PAINTING SCHEDULE

Surface	First Coat	Second Coat	Third Coat
Concrete masonry units.	FS W-110	None	None
Concrete, unless otherwise specified.	FS TT-P-19	FS TT-P-19	None
Wood	MS MIL-P-28582	FS TT-P-37	FS TT-P-37

Surface	First Coat	Second Coat	Third Coat
Ferrous metal	SSPC Paint 25	FS TT-E-489,	FS TT-E-489
---------- or	----------		
	FS TT-P-645	SSPC Paint 21, Type I	SSPC Paint 21 Type I
Galvanized.	N/A	N/A	N/A
Aluminum aluminum-alloy, and other non- ferrous metal (non-galvanized)	FS TT-P-645	FS TT-E-489,	FS TT-E-489
		----------or----------	
		SSPC Paint 21, Type I	SSPC Paint 21 Type I

INTERIOR PAINTING SCHEDULE

Surface	First Coat	Second Coat	Third Coat
Concrete masonry units	CID A-A- 1500	FS TT-P-102	FS TT-P-102
	----------	or	----------
		FS TT-P-650	FS TT-E-508
Ferrous metal unless otherwise specified.	SSPC Paint 5	FS TT-P-30	FS TT-P-30
	----------	or	----------
	SSPC Paint 25	FS TT-E-545	FS TT-E-508
	FS TT-P-645		------or------
			FS TT-E509

Surface	First Coat	Second Coat	Third Coat
Ferrous metal factory-primed mechanical and electrical equipment.	FS TT-E-489,	FS TT-E-489,	None
	----------or----------		
	SSPC Paint 21, Type I	SSPC Paint 21, Type I	None
Galvanized:	SSPC Paint 5	Two coats of paint to match adjacent areas	
Wood: unless otherwise specified.	FS TT-E-545	FS TT-P-30	None
		FS TT-E-508	None
		----------or----------	
		FS TT-E-509	None
Metal: electrical conduit runs, metallic tubing, uninsulated ducts and pipes, pipe hangers, louvers,	Ferrous metal: SSPC Paint 5	FS TT-E-545	FS TT-E-506
		FS TT-P-645	FS TT-E-508
	------or-------		
Aluminum:	FS TT-E-509 FS TT-P-645		
Galvanized surface:	SSPC Paint 5		
		FS TT-E-489	FS TT-E-489
Facing of vapor barrier jackets	Two coats of paint to match adjacent areas.		None
Oil-based caulking compound.	FS TT-P-38	Same as adjacent areas	

END OF SECTION 09900

SECTION 09915

COLOR SCHEDULE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

FEDERAL STANDARDS (FED-STD)

FED-STD 595 (Rev B) Color Used in Government Procurement

1.2 GENERAL

This section covers only the color of the exterior and interior materials and products that are exposed to view in the finished construction. The word "color" as used herein includes surface color and pattern. Requirements for quality and method of installation are covered in other appropriate sections of the specifications. Specific locations where the various materials are required are shown on the drawings. Items not designated for color in this section may be specified in other sections. When color is not designated for items, the Contractor shall propose a color for approval.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-14 Samples

Color board; FIO

Two sets of color boards, 120 days after the Contractor is given Notice to proceed, complying with the following requirements:

a. Color boards shall reflect all actual finish textures, patterns, and colors required for this contract.

b. Materials shall be labeled with the finish type, manufacturer's name, pattern, and color reference.

c. Samples shall be on size A4 or 8-1/2 by 11 inch boards with a maximum spread of size A1 or 25-1/2 by 33 inches for foldouts.

d. Samples for this color board are required in addition to samples requested in other specification sections.

e. Color boards shall be submitted as specified in Article 37 of Section 00800.

PART 2 PRODUCTS

2.1 COLOR REFERENCES

FED-STD 595 numbers are specified for color reference only. Where a product is specified to be a factory finished item, the color shall match the FED-STD 595 color. Federal standard colors are designated by five digit numbers, the first of which specifies luster. Since the luster is specified in Section 09900, PAINTING, GENERAL, luster is not referenced within this specification. The first digit is omitted and replaced with an "x" when referenced. FED-STD 595 colors are on file in the office of the Contracting Officer. Manufacturers colors indicated in parenthesis are for reference only.

2.2 COLOR SCHEDULE

The color schedule lists the colors, patterns and textures required for exterior and interior finishes, including both factory applied and field applied colors.

2.2.1 Exterior Walls

Exterior wall colors shall apply to exterior wall surfaces including recesses at entrances and projecting vestibules.

a. Concrete Masonry: FSN 595-X3522 (Glidden 20YY 53/124).

b. Metal Siding: FSN 595-X6555 (Glidden 30YY 50/176).

c. Hardware, and Associated Trim: See Section 08700.

2.2.2 Exterior Trim

Exterior trim shall be provided to match the colors listed below.

a. Doors and Door Frames: FSN 595-X0095 (Glidden 10YY 14/080)

b. Steel windows (mullion, muntin, sash, trim): FSN 595-X0095 (Glidden 10YY 14/080)

c. Aluminum Window: Bronze Anodized

d. Metal "Glazing": FSN 595-X0095 (Glidden 10YY 14/080)

e. Plywood: FSN 595-X0095 (Glidden 10YY 14/080)

f. Fascia: Treated wood FSN 595-X0095 (Glidden 10YY 14/080)

g. Flashings: FSN 595-X0095 (Glidden 10YY 14/080)

h. Stairs and railings: FSN 595-X0095 (Glidden 10YY 14/080)

i. Metal Soffits and Ceilings: FSN 595-X0095 (Glidden 10YY 14/080)

j. Overhangs: FSN 595-X0095 (Glidden 10YY 14/080)

k. Caulking and Sealants: FSN 595-X0095 (Glidden 10YY 14/080)

l. Safety Chain: Factory Finish

m. Post for emergency stop button: FSN FSN 595-X1105

n. Steel framing: FSN 595-X0095 (Glidden 10YY 14/080)

o. Warning signs / lettering: FSN 595-X7875

p. Warning signs / background: FSN 595-X0095 (Glidden 10YY 14/080)

q. Warning signs posts: FSN 595-X0095 (Glidden 10YY 14/080)

r. Bumper Post: FSN 595-X0095 (Glidden 10YY 14/080)

s. Fire Hydrant: FSN 595-X0318 (Glidden 20YY 33/145)

t. Fire extinguisher cabinet : FSN 595-X1105

u. Piping: Galvanized (U.N.O.)

v. LGP Piping: FSN 595-X7875

2.2.3. Exterior Roof

Roof color shall apply to exterior roof surfaces including sheet metal flashings roof trim, pipes, conduits, and similar items. Roof color shall be provided to match the colors listed below.

a. Metal: FSN 595-x0117 (Glidden 60yr 13/140)

b. Shingles: Bird Roofing - Cinnamon Brown

2.2.4 Airframe

a. Support columns: Galvanized

b. Remainder: Unpainted.

2.2.5 Liquid Propane System

a. Paint all liquid propane piping and tanks white, in accordance with accepted propane industry safety practices.

b. Apply color code banding as specified in Section 09900-Painting.

2.2.6 Interior Floor Finishes

Flooring materials shall be provided to match the colors listed below.

a. Stair Treads: FSN 595-X3655

b. Concrete: Sealer (clear)

2.2.7 Interior Wall Finishes Smokehouse

Interior wall color shall apply to the entire wall surface, including reveals, vertical furred spaces, grilles, diffusers, electrical and access panels, and piping and conduit adjacent to wall surfaces unless otherwise specified. Items not specified in other paragraphs shall be painted to match adjacent wall surface.

a. Paint: FSN 595-X7038

2.2.8 Interior Trim Smokehouse

Interior trim shall be provided to match the colors listed below.

a. Doors: FSN 595-X7038

b. Door Frames: FSN 595-X7038

c. Windows (mullion, muntin, sash, and trim): FSN 595-X7038

d. Metal "Glazing": FSN 595-X7038

e. Stair Stringers: FSN 595-X7038

f. Stair Railings: FSN 595-X7038

g. Partition Support System: FSN 595-X7038

2.2.9 Interior Exposed Construction at Ceiling

Exposed ceiling construction to match the color listed below.

a. Exposed steel framing: FSN 595-X7038

b. Exposed steel deck: FSN 595-X7038

c. Exposed concrete: FSN 595-X7038

d. Exposed wood framing and plywood: FSN 595-X7038

PART 3 EXECUTION (Not Applicable)

END OF SECTION 09915

SECTION 10520 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Portable fire extinguishers.
2. Wheeled fire extinguishers.
3. Fire-protection cabinets for the following:

   a. Portable fire extinguishers.
   b. Fire hose valves.
   c. Fire hoses and racks.
   d. Fire extinguishers and fire hoses.

4. Fire-protection accessories.

B. Related Sections include the following:

1. Division 7 Section "Firestopping" for firestopping sealants at fire-rated cabinets.
2. Division 9 Section "Painting" for field-painting fire-protection cabinets.
3. Division 10 Section "Signs" for directional signage to out-of-sight fire extinguishers and cabinets.
4. Division 11 Section "Food Service Equipment" for fire extinguishing systems provided as part of exhaust hoods.
5. Division 15 Section "Standpipe and Sprinkler Systems" for hose systems and racks.
6. Division 15 Section "Standpipe and Hose Systems" for fire hoses in cabinets.
7. Division 16 Section "Interior Lighting" for fire extinguisher location lights.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.

1. Fire Extinguishers: Include rating and classification.
2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
3. Show location of knockouts for hose valves.

B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.

C. Samples for Verification: For each type of exposed cabinet finish required, prepared on Samples of size indicated below and of same thickness and material indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. Size: 6-by-6-inch- (150-by-150-mm-) square Samples.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide extinguishers listed and labeled by FM.

1.5 COORDINATION

A. Coordinate size of cabinets to ensure that type and capacity of fire extinguishers indicated and provided by Owner under separate Contract are accommodated.

B. Coordinate size of cabinets to ensure that type and capacity of hoses, hose valves, and hose racks indicated are accommodated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Portable Fire Extinguishers:

a. Amerex Corporation.
b. Ansul Incorporated.
c. Badger; Div. of Figgie Fire Protection Systems.
d. Buckeye Fire Equipment Company.
e. Fire-End & Croker Corporation.
f. General Fire Extinguisher Corporation.
g. J.L. Industries, Inc.
h. Kidde: Walter Kidde, The Fire Extinguisher Co.

i. Larsen's Manufacturing Company.
j. Modern Metal Products; Div. of Technico.
k. Moon/American, Inc.
l. Pem All; Div. of Pem Systems, Inc.
m. Potter-Roemer; Div. of Smith Industries, Inc.
n. Samson Products, Inc.
o. Watrous; Div. of American Specialties, Inc.

2. Wheeled Fire Extinguishers:

a. Amerex Corporation.
b. Ansul Incorporated.
c. Badger; Div. of Figgie Fire Protection Systems.
d. Buckeye Fire Equipment Company.
e. Fire-End & Croker Corporation.
f. General Fire Extinguisher Corporation.
g. Walter Kidde, The Fire Extinguisher Co.
h. Moon/American, Inc.
i. Pem All; Div. of Pem Systems, Inc.

3. Fire-Protection Cabinets:

a. Filtrine Manufacturing Company.
b. Fire-End & Croker Corporation.
c. General Accessory Manufacturing Co.
d. J.L. Industries, Inc.
e. Larsen's Manufacturing Company.
f. Modern Metal Products; Div. of Technico.
g. Moon/American, Inc.
h. Potter-Roemer; Div. of Smith Industries, Inc.
i. Samson Products, Inc.
j. Thomas Enterprises.
k. Watrous; Div. of American Specialties, Inc.

C. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified in the Fire-Protection Cabinet Schedule at the end of Part 3.

D. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Fire-Protection Cabinet Schedule at the end of Part 3.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209 (ASTM B 209M).
2. Extruded Shapes: ASTM B 221 (ASTM B 221M).

C. Stainless-Steel Sheet: ASTM A 666/A 666M, Type 302 or Type 304 alloy.

D. Copper-Alloy Sheet, Brass: ASTM B 36/B 36M, alloy UNS No. C26000 (cartridge brass, 70 percent copper).

E. Copper-Alloy Sheet, Bronze: ASTM B 36/B 36M, alloy UNS No. C28000 (muntz metal, 60 percent copper).

2.3 PORTABLE FIRE EXTINGUISHERS

A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.

B. Stored-Pressure Water Type: UL-rated 2-A, 2-1/2-gal. (9.5-L) nominal capacity, in stainless-steel container with pressure-indicating gage.

C. Stored-Pressure Antifreeze Type: UL-rated 2-A, 2-1/2-gal. (9.5-L) nominal capacity containing approved antifreeze solution mixed for temperatures as low as minus 40 deg F (minus 40 deg C), in stainless-steel container with pressure-indicating gage.

D. Pressurized, Solid AFFF Type: UL-rated 3-A:40B, 2-1/2-gal. (9.5-L) nominal capacity, in stainless-steel container with pressure-indicating gage.

E. Dry-Chemical Type: UL-rated 5-B:C, 2-1/2-lb (1.1-kg) nominal capacity, in enameled-steel container.

F. Dry-Chemical Type: UL-rated 10-B:C, 5-lb (2.3-kg) nominal capacity, in enameled-steel container.

G. Dry-Chemical Type: UL-rated 40-B:C, 10-lb (4.5-kg) nominal capacity, in enameled-steel container.

H. Multipurpose Dry-Chemical Type: UL-rated 1-A:10-B:C, 2-1/2-lb (1.1-kg) nominal capacity, in enameled-steel container.

I. Multipurpose Dry-Chemical Type: UL-rated 2-A:10:B:C, 5-lb (2.3-kg) nominal capacity, in enameled-steel container.

J. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, in enameled-steel container.

K. Carbon-Dioxide Type: UL-rated 5-B:C, 5-lb (2.3-kg) nominal capacity, in manufacturer's standard enameled-metal container.

L. Carbon-Dioxide Type: UL-rated 10-B:C, 10-lb (4.5-kg) nominal capacity, in manufacturer's standard enameled-metal container.

M. Halon Type: UL-rated 5-B:C, 2-1/2-lb (1.1-kg) nominal capacity, in enameled-steel container with pressure-indicating gage.

N. Halon Type: UL-rated 10-B:C, 5-lb (2.3-kg) nominal capacity, in enameled-steel container with pressure-indicating gage.

O. Clean-Agent Type: UL-rated 1A:10B:C, 12-lb (5.4-kg) nominal capacity of a proprietary blend of HCFC-123 and inert material, in enameled-steel container with pressure-indicating gage.

1. Product: Subject to compliance with requirements, provide "Halotron I" by Buckeye Fire Equipment Company.

2.4 WHEELED FIRE EXTINGUISHERS

A. General: Provide wheeled fire extinguishers of type, size, and capacity for locations indicated.

B. Carriage: Fabricate from enameled-steel pipe, complete with hanger assembly, long-range nozzle, semipneumatic solid-rubber tires, and the following:

1. Hose: 15 feet (4.6 m).
2. Hose: 50 feet (15.2 m).
3. Hose: 100 feet (30.5 m).

C. Pressurized, AFFF Foam Type: UL-rated 20-A:40B, 33-gal. (125- L) nominal capacity, in stainless-steel container with pressure-indicating gage.

D. Dry-Chemical Type: UL-rated 160-B:C, 50-lb (23-kg) nominal capacity, in enameled-steel container.

E. Multipurpose Dry-Chemical Type: UL-rated 30-A:160-B:C, 50-lb (23-kg) nominal capacity, in enameled-steel container.

F. Carbon-Dioxide Type: UL-rated 20-B:C, 50-lb (23-kg) nominal capacity, in manufacturer's standard enameled-metal container.

G. Nitrogen Type: UL-rated 240-B:C, 150-lb (68-kg) nominal capacity, in manufacturer's standard enameled-metal container.

2.5 FIRE-PROTECTION CABINETS

A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

1. Fire-Rated Cabinets: Listed and labeled to meet requirements of ASTM E 814 for fire-resistance rating of wall where it is installed.

   a. Construct fire-rated cabinets with double walls fabricated from 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material.
   b. Provide factory-drilled mounting holes.

2. Cabinet Metal: Enameled-steel sheet.
3. Cabinet Metal: Aluminum sheet.
4. Cabinet Metal: Stainless-steel sheet.
5. Shelf: Same metal and finish as cabinet.

B. Cabinet Type: Suitable for the following:

1. Fire extinguisher.
2. Fire extinguisher and fire hose valve.
3. Fire hose, rack, valve, and fire extinguisher.

4. Fire hose, rack, and valve.
5. Fire hose valve.

C. Cabinet Mounting: Suitable for the following mounting conditions:

1. Recessed: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.
2. Semirecessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.
3. Surface Mounted: Cabinet box fully exposed and mounted directly on wall.

D. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

1. Trimless: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet.

   a. Provide recessed flange, of same material as box, attached to box to act as plaster stop.

2. Trimless with hidden flange of same metal and finish as box that overlaps surrounding wall finish and that is concealed from view by an overlapping door.
3. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

   a. Flat Trim: 1/4- to 5/16-inch (6- to 8-mm) backbend depth.
   b. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.
   c. Rolled-Edge Trim: 2-1/2-inch (64-mm) backbend depth.
   d. Rolled-Edge Trim: 4-inch (102-mm) backbend depth.
   e. Rolled-Edge Trim: 4-1/2-inch (114-mm) backbend depth.

E. Cabinet Trim Material: Manufacturer's standard, as follows:

1. Steel sheet.
2. Aluminum sheet.
3. Extruded-aluminum shapes.
4. Stainless-steel sheet.
5. Copper-alloy sheet, brass.
6. Copper-alloy sheet, bronze.
7. Same metal and finish as door.

F. Door Material: Manufacturer's standard, as follows:

1. Steel sheet.
2. Aluminum sheet.
3. Extruded-aluminum shapes.
4. Stainless-steel sheet.
5. Copper-alloy sheet, brass.
6. Copper-alloy sheet, bronze.

G. Door Glazing: Manufacturer's standard, as follows:

1. Clear Float Glass: ASTM C 1036, Type I, Class 1, Quality q3, as follows:

   a. Thickness: 3 mm.
   b. Thickness: 6 mm.

2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, as follows:

   a. Class 1 (clear).
   b. Class 2 (tinted, heat absorbing and light reducing), bronze tint.

3. Break Glass: Clear float glass, ASTM C 1036, Type I, Class 1, Quality q3, 1.5 mm, single strength.
4. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm.
5. Wire Glass: ASTM C 1036, Type II, Class 1, Form 1, Quality q8, Mesh m1 (diamond), 6 mm thick.
6. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, 3 mm thick, double strength.
7. Acrylic: Smooth or textured sheet, as follows:

   a. Thickness: 1.5 mm.
   b. Thickness: 3 mm.
   c. Thickness: 6 mm.
   d. Color: Clear.
   e. Color: White.
   f. Color: Red.
   g. Color: Black.
   h. Color: Bronze.

8. Bubble: One-piece clear break acrylic.
9. Bubble: One-piece molded acrylic.

   a. Color: Clear.
   b. Color: Red.
   c. Color: Black.
   d. Color: Bronze.

H. Door Style: Manufacturer's standard design, as follows:

1. Fully glazed, frameless, backless, acrylic panel.
2. Fully glazed panel with frame.
3. Full bubble, frameless.
4. Full bubble with frame.
5. Full bubble with frameless, rotating turntable.
6. Horizontal duo panel with frame.
7. Vertical duo panel with frame.
8. Center glass panel with frame.
9. Solid opaque panel with frame.
10. Flush opaque panel, frameless, with no exposed hinges.

I. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.

1. Provide minimum 1/2-inch- (13-mm-) thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
2. Provide inside latch and lock for break-glass panels.

J. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action

latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.6 ACCESSORIES

A. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicated, with plated or baked-enamel finish.

1. Provide brackets for extinguishers not located in cabinets.
2. Provide brackets for extinguishers located in cabinets.

B. Break-Glass Strike: Provide manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.

C. Lettered Door Handle: Provide one-piece, cast-iron door handle with the word "FIRE" embossed into face.

D. Door Locks: Provide cylinder lock, with all cabinets keyed alike.

E. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.
2. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.

a. Application Process: Silk-screened.
b. Application Process: Engraved.
c. Application Process: Etched.
d. Application Process: Decals.
e. Application Process: Vinyl letters.
f. Lettering Color: Red.
g. Lettering Color: Black.
h. Lettering Color: White.
i. Orientation: Vertical.
j. Orientation: Horizontal.

F. Alarm: Provide manufacturer's standard alarm, which actuates when cabinet door is opened and is powered by the following:

1. Batteries.
2. Low voltage, complete with transformer.

2.7 COLORS AND TEXTURES

A. Colors and Textures: Match Architect's samples.

B. Colors and Textures: As indicated by referencing manufacturer's designations.

C. Colors and Textures: As selected by Architect from manufacturer's full range for these characteristics.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the following:

1. Exterior of cabinets and doors, except for those surfaces indicated to receive another finish.
2. Interior of cabinets and doors.

2.9 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

C. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 606.1 or AAMA 608.1.

1. Color: Light bronze.
2. Color: Medium bronze.
3. Color: Dark bronze.
4. Color: Black.
5. Color: Gold.
6. Color: Match Architect's sample.
7. Color: As selected by Architect from the full range of industry colors and color densities.

D. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.
2. Color: As indicated by manufacturer's designations.
3. Color: Match Architect's sample.
4. Color: As selected by Architect from manufacturer's full range.

2.10 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

1. Color and Gloss: As indicated by manufacturer's designations.
2. Color and Gloss: Match Architect's sample.
3. Color and Gloss: As selected by Architect from manufacturer's full range.

2.11 STAINLESS-STEEL FINISHES

A. General: Remove or blend tool and die marks and stretch lines into finish. Grind and polish surfaces to produce uniform, directionally textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

B. Polished and Buffed Finish: Oil-ground, 180-grit finish followed by buffing.

C. Bright, Cold-Rolled, Unpolished Finish: No. 2B finish.

D. Bright, Directional Polish: No. 4 finish.

E. Satin, Directional Polish: No. 6 finish.

F. Satin, Reflective, Directional Polish: No. 7 finish.

G. Mirrorlike Reflective, Nondirectional Polish: No. 8 finish.

H. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.12 COPPER-ALLOY FINISHES

A. Finish designations prefixed by CDA comply with the system established by the Copper Development Association for designating copper-alloy finish systems, as defined in NAAMM's "Metal Finishes Manual for Architectural and Metal Products."

B. Buffed Finish: CDA M21 (Mechanical Finish: buffed, smooth specular).

C. Hand-Rubbed Finish: CDA M31-M34 (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed).

D. Hand-Rubbed Finish, Lacquered: CDA M31-M34-O6x (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed; Coating: clear organic, air dry, as specified below).

1. Clear Organic Coating: Clear, air-drying, acrylic lacquer specially developed for coating copper-alloy products, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

a. Product: Subject to compliance with requirements, provide "Incralac" as developed by International Copper Research Corporation.

E. Medium-Satin Finish: CDA M32 (Mechanical Finish: directionally textured, medium satin).

F. Fine-Matte Finish: CDA M42 (Mechanical Finish: nondirectional finish, fine matte).

G. Statuary Conversion Coating over Satin Finish: CDA-M32-C55 (Mechanical Finish: directionally textured, medium satin; Chemical Finish: conversion coating, sulfide).

1. Color: Match Architect's sample.

H. Patina Conversion Coating: CDA-M36-C12-C52 (Mechanical Finish: directionally textured, uniform; Chemical Finish: nonetched cleaned, degreased; Chemical Finish: conversion coating, ammonium sulfate).

1. Color: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for hose valves, hose racks, and cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets are to be installed.

C. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged units.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing fire-protection specialties.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
2. Fasten mounting brackets to structure and cabinets, square and plumb.
3. Fasten cabinets to structure, square and plumb.

3.3 INSTALLATION OF FIRE-RATED HOSE OR VALVE CABINETS

A. Install cabinet with not more than 1/16-inch (1.5-mm) tolerance between pipe OD and knockout OD. Center pipe within knockout.

B. Seal through-penetrations with firestopping sealant specified in Division 7 Section "Firestopping."

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely.

B. Refinish or replace cabinets and doors damaged during installation.

C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

3.5 FIRE-PROTECTION CABINET SCHEDULE

A. Fire-Protection Cabinet FPC-[**#**]: Where this designation is indicated, provide fire-protection cabinet complying with the following:

1. Products: [**Provide one of the following**] [**Available products include the following**]: <CORRELATE WITH PARA RETAINED IN PART 2 "MANUFACTURERS" ARTICLE>
2. Construction: [**Nonrated**] [**Fire rated**]. <RETAIN ONE; DELETE OTHER>
3. Cabinet Material: [**Enameled-steel sheet**] [**Aluminum sheet**] [**Stainless-steel sheet**]. <RETAIN ONE; DELETE OTHERS>
4. Type: [**Fire extinguisher**] [**Fire extinguisher and fire hose valve**] [**Fire hose, rack, valve, and fire extinguisher**] [**Fire hose, rack, and valve**] [**Fire hose valve**]. <RETAIN ONE; DELETE OTHERS>
5. Mounting: [**Recessed**] [**Semirecessed**] [**Surface mounted**]. <RETAIN ONE; DELETE OTHERS>
6. Trim Style: [**Trimless**] [**Trimless with hidden flange**] [**Exposed**]. <RETAIN ONE; DELETE OTHERS>

   a. Exposed Trim: [**Flat, 1/4- to 5/16-inch (6- to 8-mm)**] [**Square, 1-1/4- to 1-1/2-inch (32- to 38-mm)**] [**Rolled, 2-1/2-inch (64-mm)**] [**Rolled, 4-inch (102-mm)**] [**Rolled, 4-1/2-inch (114-mm)**] backbend depth. <RETAIN ONE; DELETE OTHERS>

7. Cabinet Trim Material: [**Steel sheet**] [**Aluminum sheet**] [**Extruded-aluminum shapes**] [**Stainless-steel sheet**] [**Copper-alloy sheet, brass**] [**Copper-alloy sheet, bronze**] [**Same metal and finish as door**]. <RETAIN ONE; DELETE OTHERS>
8. Door Material: [**Steel sheet**] [**Aluminum sheet**] [**Extruded-aluminum shapes**] [**Stainless-steel sheet**] [**Copper-alloy sheet, brass**] [**Copper-alloy sheet, bronze**]. <RETAIN ONE; DELETE OTHERS>

9. Door Glazing: [**Clear float glass**] [**Tempered float glass**] [**Break glass**] [**Tempered break glass**] [**Wire glass**] [**Mirror glass**] [**Acrylic**] [**Clear acrylic bubble**] [**Break acrylic bubble**]. <RETAIN ONE; DELETE OTHERS>
10. Door Style: [**Fully glazed, frameless**] [**Fully glazed with frame**] [**Full bubble, frameless**] [**Full bubble with frame**] [**Full bubble with frameless, rotating turntable**] [**Horizontal duo**] [**Vertical duo**] [**Center panel**] [**Solid opaque with frame**] [**Flush opaque, frameless**]. <RETAIN ONE; DELETE OTHERS>
11. Accessories: [**Mounting brackets**] [**Break-glass strike**] [**Lettered door handle**] [**Door locks**] [**Identification lettering**] [**Alarm**]. <RETAIN APPLICABLE ACCESSORIES; DELETE OTHERS>
12. Color and Texture: [**Match Architect's samples**] [**As indicated by referencing manufacturer's designations**] [**As selected by Architect from manufacturer's full range**]. <RETAIN ONE; DELETE OTHERS>

    a. Aluminum Finish: [**Clear anodic**] [**Color anodic**] [**Baked enamel**] [**Organic**]. <RETAIN ONE; DELETE OTHERS>
    b. Steel Finish: [**Factory priming for field-painted finish**] [**Baked enamel**]. <RETAIN ONE; DELETE OTHER>
    c. Stainless-Steel Finish: [**Bright, cold-rolled, unpolished: No. 2B**] [**Bright, directional polish: No. 4**] [**Satin, directional polish: No. 6**] [**Satin, reflective, directional polish: No. 7**] [**Mirrorlike reflective, nondirectional polish: No. 8**]. <RETAIN ONE; DELETE OTHERS>
    d. Copper Alloy, Brass: [**Buffed**] [**Hand rubbed**] [**Hand rubbed, lacquered**] [**Medium satin**] [**Fine matte**] [**Statuary conversion**] [**Patina conversion**]. <RETAIN ONE; DELETE OTHERS>
    e. Copper Alloy, Bronze: [**Buffed**] [**Hand rubbed**] [**Hand rubbed, lacquered**] [**Medium satin**] [**Fine matte**] [**Statuary conversion**] [**Patina conversion**]. <RETAIN ONE; DELETE OTHERS>

END OF SECTION 10520

SECTION 10522

FIRE EXTINGUISHER, CABINET AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes the following:

Portable fire extinguishers.
Fire extinguisher cabinets.
Fire-protection accessories.

Related Sections include the following:

Division 9 Section "Painting" for field-painting fire extinguisher cabinets.

1.3 SUBMITTALS

1.3.1 SD-01 Data

Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.

Fire Extinguishers: Include rating and classification.

Cabinets: Include details showing mounting methods, door hardware, cabinet type, and panel style.

1.3.2 SD-14 Samples

Samples for Verification: For each type of exposed cabinet finish required, prepared on Samples of size indicated below and of same thickness and material indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

Size: 6-by-6-inch square Samples.

1.4 QUALITY ASSURANCE

Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.

NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers and NFPA 58 "Standard for the storage and handling of liquefied pertoleum gases."

Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

Provide extinguishers listed and labeled by FM.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.1.1 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2.1.2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Portable Fire Extinguishers:

Fire-End & Croker Corporation.
J.L. Industries, Inc.
Larsen's Manufacturing Company.
Modern Metal Products; Div. of Technico.
Moon/American, Inc.
Potter-Roemer; Div. of Smith Industries, Inc.
Samson Products, Inc.
Watrous; Div. of American Specialties, Inc.

Fire Extinguisher Cabinets:

Fire-End & Croker Corporation.
J.L. Industries, Inc.
Larsen's Manufacturing Company.
Modern Metal Products; Div. of Technico.
Moon/American, Inc.
Potter-Roemer; Div. of Smith Industries, Inc.
Samson Products, Inc.
Watrous; Div. of American Specialties, Inc.

2.2 MATERIALS

Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.

2.3 PORTABLE FIRE EXTINGUISHERS

General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.

Dry-Chemical Type: UL-rated 120-B:C, 20-lb nominal capacity, in enameled-steel container.

2.4 FIRE EXTINGUISHER CABINETS

Cabinet Construction: Provide manufacturer's standard box (tub), with frame, door, and hardware to suit cabinet type, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

Cabinet Metal: Enameled-steel sheet.

Cabinet Type: Suitable for the following:

Fire extinguisher.

Cabinet Mounting:

. Surface Mounted: Cabinet box fully exposed and mounted on security fence post. Provide suitable brackets for cabinets to post mounting.

Cabinet Trim Material: Manufacturer's standard, as follows:

Steel sheet.

Door Material: Manufacturer's standard, as follows:

Steel sheet.

Door Style: Manufacturer's standard design, as follows:

Flush opaque panel, frameless, with no exposed hinges.

Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.

Provide minimum 1/2-inch- (13-mm-) thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.

Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.5 ACCESSORIES

Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicated, with plated or baked-enamel finish.

Provide rain hood to help shield exterior mounted cabinet from weather.

Lettered Door Handle: Provide one-piece, cast-iron door handle with the word "FIRE" embossed into face.

Door Locks: Provide cylinder lock, with cabinet.

Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Contracting Officer.

Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.

Application Process: Silk-screened.
Lettering Color: White.
Orientation: Vertical.

2.6 COLORS AND TEXTURES

Colors and Textures: As indicated by referencing specification sections 09900 & 09915.

2.7 FINISHES, GENERAL

2.7.1 Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint.

2.7.2 Steel Finishes

Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.

Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

Color and Gloss: Red Semi-Gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

Examine fire extinguishers for proper charging and tagging.

Remove and replace damaged, defective, or undercharged units.

Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Comply with manufacturer's written instructions for installing fire-protection specialties.

Install on security fence surrounding LP gas storage tank in location and at mounting height acceptable to authorities having jurisdiction.

Fasten mounting brackets to structure and cabinets, square and plumb.

3.3 ADJUSTING, CLEANING, AND PROTECTION

Adjust cabinet doors that do not swing or operate freely.

Refinish or replace cabinets and doors damaged during installation.

Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10520

SECTION 11310

PUMPS; SEWAGE AND SLUDGE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABEMA)

ABEMA 9	(1990) Load Ratings and Fatigue Life for Ball Bearings
ABEMA 11	(1990) Load Ratings and Fatigue Life for Roller Bearings

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 153	(1982; R 1987) Zinc Coating (Hot-Dip) on Iron and Steel Hardware

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1	(1993)Industrial Controls and Systems
NEMA MG 1	(1993) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1993) National Electrical Code

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01305 SUBMITTAL PROCEDURES:

SD-01 Data

Sewage and Sludge Pump System FIO.

Pump characteristic curves showing capacity in gpm, net positive suction head (NPSH), head, efficiency, and pumping horsepower from 0 gpm to 110 percent (100 percent for positive displacement pumps) of design capacity. A complete list of equipment and material, including manufacturer's descriptive data and technical literature, performance charts and curves, catalog cuts, and installation instructions.

Spare Parts FIO.

Spare parts data for each different item of material and equipment specified, after approval of the related submittals, and not later than 3 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-04 Drawings

Sewage and Sludge Pump System FIO.

Drawings containing complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-06 Instructions

Sewage and Sludge Pump System FIO.

Diagrams, instructions, and other sheets proposed for posting.

SD-09 Reports

Field Testing and Adjusting Equipment; FIO.

Performance test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-19 Operation and Maintenance Manuals

Sewage and Sludge Pump System; GA.

Six copies of operation and six copies of maintenance manuals for the equipment furnished. One complete set prior to performance testing and the remainder upon acceptance. Operation manuals shall detail the step-by-step procedures required for system startup, operation, and shutdown. Operation manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include piping and equipment layout and simplified wiring and control diagrams of the system as installed. Manuals shall be approved prior to the field training course.

1.3 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be stored with protection from the weather, excessive humidity and excessive temperature variation; and dirt, dust, or other contaminants.

1.4 FIELD MEASUREMENTS

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

PART 2 PRODUCTS

2.1 GENERAL MATERIAL AND EQUIPMENT REQUIREMENTS

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Pump casings shall be constructed of cast iron of uniform quality and free from blow holes, porosity, hard spots, shrinkage defects, cracks, and other injurious defects. Impellers shall be cast iron.

2.1.1 Nameplates

Each major item of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

2.1.2 Equipment Guards

Belts, pulleys, chains, gears, projecting setscrews, keys, and other rotating parts so located that any person may come in close proximity thereto shall be enclosed or guarded.

2.1.3 Special Tools

One set of special tools, calibration devices, and instruments required for operation, calibration, and maintenance of the equipment shall be provided.

2.1.4 Electric Motors

Motors shall conform to NEMA MG 1.

2.1.5 Motor Controls

Controls shall conform to NEMA ICS 1.

2.1.6 Bolts, Nuts, Anchors, and Washers

Bolts, nuts, anchors, and washers shall be steel; galvanized in accordance with ASTM A 153.

2.1.7 Pressure Gauges

Compound gauges shall be provided on the suction side of pumps and standard pressure gauges on the discharge side of pumps. Gauges shall comply with ASME B40.1. Gauge ranges shall be as appropriate for the particular installation.

2.2 SUBMERSIBLE CENTRIFUGAL PUMPS

Submersible centrifugal pumps shall be centrifugal type pumps designed to pump solids up to 3 inches in diameter and shall be capable of withstanding submergence as required for the particular installation.

2.2.1 Pump Characteristics

Pump numbers 1 and 2 located in the wet well shall have the following operating characteristics:

a. Pump Service: Flygt Model CP3102

b. Design Operating Point: 125 gpm flow, 52 feet head.

c. Impeller Type: 435.

d. Operating Speed: 1735 rpm.

e. Depth of Submergence: 2.5 feet.

f. Motor Type: Induction.

g. Electrical Characteristics: 208 volts ac, 3 phase, 60 Hz.

h. Size: Within rated load driving pump at specified rpm.

i. Pump Control: liquid level sensors.

2.2.2 Pump Casing

The casing shall be capable of withstanding operating pressures 50 percent greater than the maximum operating pressures. The volute shall have smooth passages which provide unobstructed flow through the pump.

2.2.3 Mating Surfaces

Mating surfaces where watertight seal is required, including seal between discharge connection elbow and pump, shall be machined and fitted with nitrile rubber O-rings. Fitting shall be such that sealing is accomplished by metal-to-metal contact between mating surfaces, resulting in proper compression of the O-rings without the requirement of specific torque limits.

2.2.4 Coatings

Exterior surfaces of the casing in contact with sewage shall be protected by a sewage resistant coal tar epoxy coating. All exposed nuts and bolts shall be stainless steel.

2.2.5 Impeller

The impeller shall be of the double shrouded non-clogging design to minimize clogging of solids, fibrous materials, heavy sludge, or other materials found in sewage. The impeller shall be statically, dynamically, and hydraulically balanced within the operating range and to the first critical speed at 150 percent of the maximum operating speed. The impeller shall be securely keyed to the shaft with a locking arrangement whereby the impeller cannot be loosened by torque from either forward or reverse direction.

2.2.6 Wearing Rings

Wearing rings, when required, shall be renewable type and shall be provided on the impeller and casing and shall have wearing surfaces normal to the axis of rotation. Material for wear rings shall be standard of pump manufacturer. Wearing rings shall be designed for ease of maintenance and shall be adequately secured to prevent rotation.

2.2.7 Pump Shaft

The pump shaft shall be of high grade alloy steel and shall be of adequate size and strength to transmit the full driver horsepower with a liberal safety factor.

2.2.8 Seals

A tandem mechanical shaft seal system running in an oil bath shall be provided. Seals shall be of tungsten carbide with each interface held in contact by its own spring system.

2.2.9 Bearings

Pump bearings shall be ball or roller type designed to handle all thrust loads in either direction. Pumps depending only on hydraulic balance end thrust will not be acceptable. Bearings shall have an ABEMA L-10 life of 50,000 hours minimum, as specified in ABEMA 9 or ABEMA 11.

2.2.10 Motor

The pump motor shall have Class F insulation, NEMA B design, in accordance with NEMA MG 1, and shall be watertight. The motor shall be either oil filled, air filled with a water jacket, or air filled with cooling fins which encircles the stator housing.

2.2.11 Power Cable

The power cable shall comply with NFPA 70, Type SO, and shall be of standard construction for submersible pump applications. The power cable shall enter the pump through a heavy duty entry assembly provided with an internal grommet assembly to prevent leakage. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board which shall isolate the motor interior from foreign material gaining access through the pump top.

2.2.12 Installation Systems

2.2.12.1 Rail Mounted Systems

Rail mounted installation systems shall consist of guide rails, a sliding bracket, and a discharge connection elbow. Guide rails shall be of the size and type standard with the manufacturer and shall not support any portion of the weight of the pump. The sliding guide bracket shall be an integral part of the pump unit. The discharge connection elbow shall be permanently installed in the wet well along with the discharge piping. The pump shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection and service without entering the pump well.

2.2.12.2 Bolt Down Systems

The pump mount system shall include a base designed to support the weight of the pump. The base shall be capable of withstanding all stresses imposed upon it by vibration, shock, and direct and eccentric loads.

2.2.12.3 Lifting Chain

Lifting chain to raise and lower the pump through the limits indicated shall be provided. The chain shall be galvanized or stainless steel and shall be capable of supporting the pump.

2.3 ELECTRICAL WORK

Electrical motor driven equipment specified shall be provided complete with motors, motor starters, and controls. Electric equipment and wiring shall be in accordance with Section 16415 ELECTRICAL WORK, INTERIOR. Electrical characteristics shall be as specified or indicated. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary for the motor control specified. Manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices but not shown, shall be provided.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

3.1.1 Pump Installation

Pumping equipment and appurtenances shall be installed in the position indicated and in accordance with the manufacturer's written instructions. All appurtenances required for a complete and operating pumping system shall be provided, including such items as piping, conduit, valves, wall sleeves, wall pipes, concrete foundations, anchors, grouting, pumps, drivers, power supply, seal water units, and controls.

3.1.2 Concrete

Concrete shall conform to Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

3.2 PAINTING

Pumps and motors shall be thoroughly cleaned, primed, and given two finish coats of paint at the factory in accordance with the recommendations of the

manufacturer. Field painting required for ferrous surfaces not finished at the factory is specified in Section 09900 PAINTING, GENERAL.

3.3 FIELD TESTING AND ADJUSTING EQUIPMENT

3.3.1 Operational Test

Prior to acceptance, an operational test of all pumps, drivers, and control systems shall be performed to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that the equipment is not electrically, mechanically, structurally, or otherwise defective; is in safe and satisfactory operating condition; and conforms with the specified operating characteristics. Prior to applying electrical power to any motor driven equipment, the drive train shall be rotated by hand to demonstrate free operation of all mechanical parts. Tests shall include checks for excessive vibration, leaks in all piping and seals, correct operation of control systems and equipment, proper alignment, excessive noise levels, and power consumption.

3.3.2 Retesting

If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be reconducted.

3.4 MANUFACTURER'S SERVICES

Services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment.

3.5 POSTING FRAMED INSTRUCTIONS

Framed instructions containing wiring and control diagrams under glass or in laminated plastic shall be posted where directed. Condensed operating instructions, prepared in typed form, shall be framed as specified above and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the system.

3.6 FIELD TRAINING

A field training course shall be provided for designated operating and maintenance staff members. Training shall be provided for a total period of 8 hours of normal working time and shall start after the system is functionally complete but prior to final acceptance tests. Field training shall cover all of the items contained in the operating and maintenance manuals.

-- End of Section --

SECTION 15052 WELDING PRESSURE PIPING

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z49.1	(1988) Safety in Welding and Cutting

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT-01	(1992; Supple) Recommended Practice SNT-TC-1A
ASNT-02	(1980) Question and Answer Book A: Radiographic Test Method; Levels I, II, III (Supplement to Recommended Practice SNT-TC-1A)
ASNT-03	(1994) Question and Answers Levels I, II, and III Magnetic Particle Method (Supplement to SNT-TC-1A) (Book B)
ASNT-04	(1980) Question and Answer Book C: Ultrasonic Testing Method; Levels I, II, III (Supplement to Recommended Practice SNT-TC-1A
ASNT-05	(1980) Question and Answer Book D: Liquid Penetrant Testing Method; Levels I, II, III (Supplement to Recommended Practice SNT-TC-1A)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B31.1	(1992; B31.1a; B31.1b; B31.1c) Power Piping
ASME B31.4	(1992; B31.4a) Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols
ASME B31.8	(1992; B31.8a; B31.8b) Gas Transmission and Distribution Piping Systems
ASME BPV I	(1992; Addenda Dec 1992, Dec 1993, Dec 1994) Boiler and Pressure Vessel Code; Section I, Power Boilers
ASME BPV II Pt C	(1992; Addenda Dec 1992, Dec 1993, Dec 1994) Boiler and Pressure Vessel Code; Section II, Materials, Part C - Specifications for Welding Rods, Electrodes and Filler Metals
ASME BPV V	(1992; Addenda Dec 1992, Dec 1993, Dec 1994) Boiler and Pressure Vessel Code;

	Section V, Nondestructive Examination
ASME BPV IX	(1992; Addenda Dec 1992, Dec 1993, Dec 1994) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(1993) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A3.0	(1994) Standard Welding Terms and Definitions
AWS D10.9	(1980) Qualification of Welding Procedures and Welders for Piping and Tubing
AWS QC1	(1988) Standard for AWS Certification of Welding Inspectors
AWS Z49.1	(1988) Safety in Welding and Cutting

1.2 DEFINITIONS

Definitions shall be in accordance with AWS A3.0.

1.3 GENERAL REQUIREMENTS

This section covers the welding of pressure piping systems. Deviations from applicable codes, approved procedures, and approved detail drawings will not be permitted without prior written approval. Materials or components with welds made off the site will not be accepted if the welding does not conform to the requirements of this specification, unless otherwise specified. Procedures shall be developed by the Contractor for welding all metals included in the work. Welding shall not be started until welding procedures, welders, and welding operators have been qualified. Qualification testing shall be performed by an approved testing laboratory, or by the Contractor if approved by the Contracting Officer. Costs of such testing shall be borne by the Contractor. The Contracting Officer shall be notified at least 24 hours in advance of the time and place of the tests. When practicable, the qualification tests shall be performed at or near the worksite. The Contractor shall maintain current records of the test results obtained in the welding procedure, welding operator, welder performance qualifications, and nondestructive examination (NDE) procedures readily available at the site for examination by the Contracting Officer. The procedures for making transition welds between different materials or between plates or pipes of different wall thicknesses shall be qualified. ASME B31.1, ASME B31.4, ASME B31.8 requirements for branch connections may be used in lieu of detailed designs. Unless otherwise specified, the choice of welding process shall be the responsibility of the Contractor.

1.4 PERFORMANCE

The Contractor shall be responsible for the quality of all joint preparation, welding, and examination. All materials used in the welding operations shall be clearly identified and recorded. The inspection and testing defined in this specification are minimum requirements. Additional

inspection and testing shall be the responsibility of the Contractor when he deems it necessary to achieve the quality required.

1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Qualifications; FIO.

Welding procedure qualification.

SD-13 Certificates

Qualifications; FIO.

Welder and welding operator performance qualification certificates. Welding inspectors and NDE personnel certificates. Qualifications of testing laboratory or the Contractor's quality assurance organization.

1.6 QUALIFICATIONS

Welding procedures, welders, and welding operators previously qualified by test may be accepted for the work without requalification, provided that all of the following conditions are fulfilled:

a. Copies of the welding procedures, the procedure qualification test records, and the welder and welding operator performance qualification test records are submitted and approved in accordance with paragraph SUBMITTALS.

b. Testing was performed by an approved testing laboratory or technical consultant or by the Contractor's approved quality assurance organization.

c. The welding procedures, welders, and welding operators were qualified in accordance with ASME BPV IX, or AWS D10.9, AR-2 level; and base materials, filler materials, electrodes, equipment, and processes conformed to the applicable requirements of this specification.

d. The requirements of paragraph "Renewal of Qualification" below are met and records showing name of employer and period of employment using the process for which qualified are submitted as evidence of conformance.

1.6.1 Welding Procedures Qualification

The Contractor shall record in detail and shall qualify the Welding Procedure Specifications for every welding procedure that he proposes. Qualification for each welding procedure shall conform to the requirements of ASME B31.1, ASME B31.4, ASME B31.8, and to this specification. The welding procedures shall specify end preparation for butt welds including cleaning, alignment, and root openings. Preheat, interpass temperature control, and postheat treatment of welds shall be as required by approved welding procedures, unless otherwise indicated or specified. The type of backing rings or consumable inserts, if used, shall be described and if they are to be removed, the removal process shall be described. Copies of the welding procedure

specifications and procedure qualification test results for each type of welding required shall be submitted in accordance with paragraph SUBMITTALS. Approval of any procedure does not relieve the Contractor of the sole responsibility for producing acceptable welds. Welding procedures shall be identified individually and shall be referenced on the detail drawings or keyed to the contract drawings.

1.6.2 Welder and Welding Operator Performance

Each welder and welding operator assigned to work shall be qualified in accordance with ASME B31.1, ASME B31.4, ASME B31.8.

1.6.2.1 Certification

Before assigning welders or welding operators to the work, the Contractor shall provide the Contracting Officer with their names together with certification that each individual is performance-qualified as specified. The certification shall state the type of welding and positions for which each is qualified, the code and procedure under which each is qualified, date qualified, and the firm and individual certifying the qualification tests.

1.6.2.2 Identification

Each welder or welding operator shall be assigned an identifying number, letter, or symbol that shall be used to identify all of his welds. To identify welds, written records indicating the location of welds made by each welder or welding operator shall be submitted, and each welder or welding operator shall apply his mark adjacent to his welds using a rubber stamp or felt-tipped marker with permanent, weatherproof ink or other methods approved by the Contracting Officer that do not deform the metal.

For seam welds, identification marks shall be placed adjacent to the welds at 3 foot intervals. Identification by die stamps or electric etchers will not be allowed.

1.6.2.3 Renewal of Qualification

Requalification of a welder or welding operator shall be required under any of the following conditions:

a. When a welder or welding operator has not used the specific welding process for a period of 3 months; the period may be extended to 6 months if he has been employed on some other welding process.

b. When a welder or welding operator has not welded with any process during a period of 3 months, all his qualifications shall be expired, including any extended by virtue of a., above.

c. There is specific reason to question his ability to make welds that will meet the requirements of the specifications.

d. The welder or welding operator was qualified by an employer other than those firms performing work under this contract and a qualification test has not been taken within the preceding 12 months.

e. Renewal of qualification for a specific welding process under conditions a., b., and d., above, need be made on only a single test joint or pipe of any thickness, position, or material to reestablish the welder's or welding operator's qualification for any thickness, position, or material for which he had previously qualified.

1.6.3 Inspection and NDE Personnel

All inspection and NDE personnel shall be qualified in accordance with the following requirements.

1.6.3.1 Inspector Certification

Welding inspectors shall be qualified in accordance with AWS QC1.

1.6.3.2 NDE Personnel

NDE personnel shall be certified, and a written procedure for the control and administration of NDE personnel training, examination, and certification shall be established. The procedures shall be based on appropriate specific and general guidelines of training and experience recommended by ASNT-01, ASNT-02 ASNT-03 ASNT-04 and ASNT-05.

1.7 DELIVERY, STORAGE, AND HANDLING

All filler metals, electrodes, fluxes, and other welding materials shall be delivered to the site in manufacturers' original packages and stored in a dry space until used. Packages shall be properly labeled and designed to give maximum protection from moisture and to insure safe handling.

1.7.1 Material Control

Materials shall be stored in a controlled access and clean, dry area that is weathertight and is maintained at a temperature recommended by the manufacturer. The materials shall not be in contact with the floor and shall be stored on wooden pallets or cribbing.

1.7.1.1 Damaged Containers

Low-hydrogen steel electrodes shall be stored in their sealed shipping container. If the seal is damaged during shipment or storage, and the damage is not immediately detected, the covered electrodes in that container shall be rebaked in accordance with the manufacturer's instructions prior to issuance or shall be discarded. If a container is damaged in storage and the damage is witnessed, the electrodes from that container shall be immediately placed in a storage oven. The storage oven temperature shall be as recommended by the manufacturer or the welding material specification.

1.7.1.2 Partial Issues

When a container of covered electrodes is opened and only a portion of the content is issued, the remaining portion shall, within 1/2 hour, be placed in a storage oven.

1.7.2 Damaged Materials

Materials which are damaged shall be discarded. Covered electrodes which are oil or water-soaked, dirty, or on which the flux has separated from the wire shall be discarded.

1.8 SYMBOLS

Symbols shall be in accordance with AWS A2.4.

1.9 SAFETY

Safety precautions shall conform to AWS Z49.1.

PART 2 - PRODUCTS

2.1 WELDING MATERIALS

Welding materials shall comply with ASME BPV II Pt C. Welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator using qualified welding procedures.

PART 3 - EXECUTION

3.1 WELDING OPERATIONS

Welding shall be performed in accordance with qualified procedures using qualified welders and welding operators. Welding shall not be done when the quality of the completed weld could be impaired by the prevailing working or weather conditions. The Contracting Officer shall determine when weather or working conditions are unsuitable for welding. Welding of hangers, supports, and plates to structural members shall conform to Section 05055 WELDING, STRUCTURAL.

3.1.1 Base Metal Preparation

Oxy-fuel cutting shall not be used on austenitic stainless steel or nonferrous materials.

3.1.2 Weld Joint Fit-Up

Parts that are to be joined by welding shall be fitted, aligned, and retained in position during the welding operation by the use of bars, jacks, clamps, or other mechanical fixtures. Welded temporary attachments shall not be used except when it is impractical to use mechanical fixtures. When temporary attachments are used, they shall be the same material as the base metal, and shall be completely removed by grinding or thermal cutting after the welding operation is completed. If thermal cutting is used, the attachment shall be cut to not less than 1/4 inch from the member and the balance removed by grinding. After the temporary attachment has been removed, the area shall be visually examined.

3.1.3 Preheat and Interpass Temperatures

Preheat temperatures shall meet the requirements specified by ASME B31.1, ASME B31.4, ASME B31.8. However, in no case shall the preheat be below 50 degrees F for ferritic steel or austenitic stainless steel, or 32 degrees F for nonferrous alloys. The maximum interpass temperatures shall not exceed 300 degrees F for austenitic stainless steels, nickel alloys, and copper alloys; and 500 degrees F for carbon steels. Preheat techniques shall be such as to ensure that the full thickness of the weld joint preparation and/or adjacent base material, at least 3 inches in all directions, is at the specified temperature. Preheating by induction or resistance methods is preferred. When flame heating is used, only a neutral flame shall be employed. Oxy-fuel heating shall not be used on austenitic stainless steel or nickel-alloy materials; however, air-fuel heating is acceptable if controlled to insure that the surface temperature does not exceed 150 degrees F. Interpass temperatures shall be checked on the surface of the component within 1 inch

of the weld groove and at the starting location of the next weld pass, and for a distance of about 6 inches ahead of the weld, but not on the area to be welded.

3.1.4 Production Welding Instructions

a. Welding shall not be done when the ambient temperature is lower than 0 degree F.

b. Welding is not permitted on surfaces that are wet or covered with ice, when snow or rain is falling on the surfaces to be welded, or during periods of high winds, unless the welders and the work are properly protected.

c. Gases for purging and shielding shall be welding grade and shall have a dew point of minus 40 degrees F or lower.

d. Back purges are required for austenitic stainless steels and nonferrous alloys welded from one side and shall be set up such that the flow of gas from the inlet to the outlet orifice passes across the area to be welded. The oxygen content of the gas exiting from the purge vent shall be less than 2 percent prior to welding.

e. The purge on groove welds shall be maintained for at least three layers or 3/16 inch.

f. Removable purge dam materials shall be made of expandable or flexible plugs, such as plexiglass, plywood (which shall be dry when used), etc. Wood dams shall be kiln-dried quality. Nonremovable purge dams and purge dam adhesives shall be made of water soluble materials. Purge dams shall not be made of polyvinyl alcohol.

g. Any welding process which requires the use of external gas shielding shall not be done in a draft or wind unless the weld area is protected by a shelter. This shelter shall be of material and shape appropriate to reduce wind velocity in the vicinity of the weld to a maximum of 5 mph (440 fpm).

h. Welding of low-alloy and hardenable high-alloy steels may be interrupted provided a minimum of at least 3/8 inch thickness of weld deposit or 25 percent of the weld groove is filled, whichever is greater, and the preheat temperature is maintained during the time that welding is interrupted. If the temperature falls below the minimum preheat temperature before all welding has been completed on a joint, or, where required, before post weld heat treatment, a liquid penetrant or magnetic particle examination shall be performed to insure sound deposited metal before reheating. Welding of other materials may be interrupted without restriction provided a visual inspection is performed before welding is resumed.

i. Tack welds to be incorporated in the final welds shall have their ends tapered by grinding or welding technique. Tack welds that are cracked or defective shall be removed and the groove shall be retacked prior to welding. Temporary tack welds shall be removed, the surface ground smooth, and visually inspected. For low-alloy and hardenable high-alloy steels, the area shall be magnetic particle examination inspected.

j. When joining ferritic steel pressure piping components to austenitic stainless steel pressure piping components and postweld heat treatment is required, the following requirements apply:

(1) The weld-end preps of ferritic steel components, which are to be welded to austenitic stainless steel, shall be buttered with one of the following weld filler metals and shall conform to the specified requirements:

ASME BPV II Pt C, SFA 5.14, Classification ERNiCr-3.

ASME BPV II Pt C, SFA 5.11, Classification ENiCrFe-2.

(2) The ferritic steel weld-end prep shall be buttered, receive a postweld heat treatment as required by ASME B31.1, ASME B31.4, ASME B31.8 and then be machined with the applicable weld-end preparation. After machining, the buttered layer shall be a minimum of 1/4 inch thick.

(3) Pressure piping transition joints shall be completed using ERNiCr-3 or ENiCrFe-2 weld filler metals. No further postweld heat treatment shall be performed.

k. When joining ferritic steel pressure piping components to austenitic stainless steel pressure piping components and postweld heat treatment is not required, prepare and weld the joint using either ERNiCr-3 or ENiCrFe-2 filler metals. For service temperatures of 200 degrees F or less, stainless filler metal 309 ASME BPV II Pt C, SFA 5.4 or 5.9 is permissible in lieu of the nickel-based alloys.

l. Grinding of completed welds is to be performed only to the extent required for NDE, including any inservice examination, and to provide weld einforcement within the requirements of ASME B31.1, ASME B31.4, ASME B31.5, ASME B31.8. If the surface of the weld requires grinding, reducing the weld or base material below the minimum required thickness shall be avoided. Minimum weld external reinforcement shall be flush between external surfaces.

3.1.5 Postweld Heat Treatment

Postweld heat treatment shall be performed in accordance with ASME B31.1, ASME B31.4, ASME B31.8. Temperatures for local postweld heat treatment shall be measured continuously by thermocouples in contact with the weldment.

Postweld heat treatment of low-alloy steels, when required, shall be performed immediately upon completion of welding and prior to the temperature of the weld falling below the preheat temperature. However, postweld heat treatment may be postponed after the completion of the weld, if, immediately after the weld is completed, it is maintained at a minimum temperature of 300 degrees F) or the preheat temperature, whichever is greater, for 2 hours per 1 inch of weld thickness. For low-alloy steels, the cooling rates shall be such that temper embrittlement is avoided.

3.2 EXAMINATIONS, INSPECTIONS, AND TESTS

Visual and NDE shall be performed by the Contractor to detect surface and internal discontinuities in completed welds. All tack welds, weld passes, and completed welds shall be visually inspected. In addition, liquid penetrant examination shall be performed on root passes. Liquid penetrant examination shall be required as indicated in TABLE I. When inspection and testing indicates defects in a weld joint, the weld shall be repaired by a qualified welder in accordance with paragraph CORRECTIONS AND REPAIRS.

TABLE I. MANDATORY MINIMUM NONDESTRUCTIVE EXAMINATIONS

Type Weld	Piping Service Conditions and Nondestructive Test		
	Temperatures over 750 degrees F and at all pressures.	Temperatures between 350 degrees F and 750 degrees F inclusive and at pressures above 1,025 psig.	All others.
Butt Welds (Girth and Longitudinal)	RT for NPS over 2 inch MT or PT for NPS 2 inches and less.	RT for over 2 inch NPS with thickness over 3/4 inch. Visual for all sizes with thickness 3/4 inch or less.	Visual for all sizes and thicknesses.
Welded Branch Connections (Size indicated is branch size) (See Note 7)	RT for NPS over 4 inch MT or PT for NPS 4 inches and less.	RT for branch over 4 inch NPS and thickness of branch over 3/4 inch. Visual for all sizes with branch thickness 3/4 inch or less.	Visual for all sizes and thicknesses.
Fillet, Socket Attachment and Seal Welds	PT or MT for all sizes and thicknesses.	Visual for all sizes and thicknesses.	Visual for all sizes and thicknesses.

NOTES TO TABLE I

(1) All welds must be given a visual examination in addition to type of specific nondestructive examination specified.

(2) NPS - nominal pipe size.

(3) PT - liquid penetrant examination.

(4) The thickness of butt welds is defined as the thicker of the two abutting ends after end preparation.

(5) Temperatures and pressures shown are design.

(7) Fillet welds not exceeding 1/4 inch throat thickness which are used for the permanent attachment of nonpressure retaining parts are exempt from the PT or MT requirements of the above table.

3.2.1 Random NDE Testing

When random liquid penetrant examination is required, the Contractor shall test a minimum of 30 percent of the total length or number of piping welds. The welds inspected shall be selected randomly, but the selection shall include an examination of welds made by each welding operator or welder. If

the random testing reveals that any welds fail to meet minimum quality requirements, an additional 10 percent of the welds in that same group shall be inspected. If all of the additional welds inspected meet the quality requirements, the entire group of welds represented shall be accepted and the defective welds shall be repaired. If any of the additional welds inspected also fail to meet the quality requirements, that entire group of welds shall be rejected. The rejected welds shall be removed and rewelded, or the rejected welds shall be 100 percent inspected and all defective weld areas removed and rewelded.

3.2.2 Visual Inspection

Weld joints shall be inspected visually as follows:

a. Before welding - for compliance with requirements for joint preparation, placement of backing rings or consumable inserts, alignment and fit-up, and cleanliness.

b. During welding - for cracks and conformance to the qualified welding procedure.

c. After welding - for cracks, contour and finish, bead reinforcement, undercutting, overlap, and size of fillet welds.

3.2.3 NDE Testing

NDE shall be in accordance with written procedures. Procedures for liquid penetrant tests and methods shall conform to ASME BPV V. The approved procedure shall be demonstrated to the satisfaction of the Contracting Officer. In addition to the information required in ASME BPV V, the written procedures shall include the timing of the NDE in relation to the welding operations and safety precautions.

3.2.4 Inspection and Tests by the Government

The Government will perform inspection and supplemental nondestructive or destructive tests as deemed necessary. The cost of supplemental NDE will be borne by the Government. The correction and repair of defects and the reexamination of weld repairs shall be performed by the Contractor at no additional cost to the Government. Inspection and tests will be performed as required for visual inspection and NDE, except that destructive tests may be required also. When destructive tests are ordered by the Contracting Officer and performed by the Contractor and the specimens or other supplemental examinations indicate that the materials and workmanship do not conform to the contract requirements, the cost of the tests, corrections, and repairs shall be borne by the Contractor. When the specimens or other supplemental examinations of destructive tests indicate that materials or workmanship do conform to the specification requirements, the cost of the tests and repairs will be borne by the Government. When destructive tests are made, repairs shall be made by qualified welders or welding operators using welding procedures which will develop the full strength of the members cut. Welding shall be subject to inspection and tests in the mill, shop, and field. When materials or workmanship do not conform to the specification requirements, the work may be rejected at any time before final acceptance of the system containing the weldment.

3.3 ACCEPTANCE STANDARDS

3.3.1 Visual

The following indications are unacceptable:

a. Cracks.

b. Undercut on surface which is greater than 1/32 inch deep.

c. Weld reinforcement greater than 3/16 inch.

d. Lack of fusion on surface.

e. Incomplete penetration (applies only when inside surface is readily accessible).

f. Convexity of fillet weld surface greater than 10 percent of longest leg plus 0.03 inch.

g. Concavity in groove welds.

h. Concavity in fillet welds greater than 1/16 inch.

i. Fillet weld size less than indicated or greater than 1-1/4 times the minimum indicated fillet leg length.

3.3.2 Liquid Penetrant Examination

Indications whose major dimensions greater than 1/16 inch shall be considered relevant. The following relevant indications are unacceptable:

a. Any cracks or linear indications.

b. Rounded indications with dimensions greater than 3/16 inch.

c. Four or more rounded indications in a line separated by 1/16 inch or less edge-to-edge.

d. Ten or more rounded indications in any 3870 6 square inches of surface with the major dimension of this area not to exceed 6 inches with the area taken in the most unfavorable location relative to the indications being evaluated.

3.4 CORRECTIONS AND REPAIRS

Defects shall be removed and repaired as specified in ASME B31.1, ASME B31.4, ASME B31.8 unless otherwise specified. Disqualifying defects discovered between weld passes shall be repaired before additional weld material is deposited. Wherever a defect is removed, and repair by welding is not required, the affected area shall be blended into the surrounding surface eliminating sharp notches, crevices, or corners. After defect removal is complete and before rewelding, the area shall be examined by the same test method which first revealed the defect to ensure that the defect has been eliminated. After rewelding, the repaired area shall be reexamined by the same test method originally used for that area. Any indication of a defect shall be regarded as a defect unless reevaluation by NDE or by surface conditioning shows that no disqualifying defects are present. The use of any foreign material to mask, fill in, seal, or disguise welding defects will not be permitted.

END OF SECTION 15052

SECTION 15492 MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.11	1980 Forged Steel Fittings, Socket-Welding and Threaded
ANSI B31.2	(1968) Fuel Gas Piping

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME-17	(1992) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
ASME B1.20.1	(1983) Pipe Threads, General Purpose (Inch)
ASME B16.5	1988 (Errata 1988) Pipe Flanges and Flanged Fittings (ASME/ANSI B16.5)
ASME B16.9	1986 Factory-Made Wrought Steel Buttwelding Fittings (ASME/ANSI B16.9)
ASME B16.39	1986 Malleable Iron Threaded Pipe Unions (ASME/ANSI B16.39)
ASME B31.1	(1992) Power Piping
ASME B31.8	1989 (Addenda 1990) Gas Transmission and Distribution Piping Systems

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53	1990 (Rev. B) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 193	(1991a) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A194	1988 (Rev A) Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM D 2564	(1991) Solvent Cements for Poly (Vinyl Chloride) (PVC) Pipe and Fittings

ASTM D 2855	(1990) Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-25	(1978; R 1988) Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP-58	(1988) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(1991) Pipe Hangers and Supports -Selection and Application

MILITARY STANDARD (MIL. STD.)

MIL-STD-101B	Color Code for Pipelines and for Compressed Gas Cylinders
MS MIL-T-27730	(Rev A) Tape, Antiseize, Polytetrafluoroethylene, With Dispenser
MIL-V-18436	(Rev. E) Valves, Check; Bronze Cast Iron and Steel Body
MIL-V-18500	Valves, Reducing, Compressed Gas

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 15	1990 Water Fixed Spray Systems for Fire Protection
NFPA 54	1993 National Fuel Gas Code
NFPA 58	1993 Storage and Handling of Liquefied Petroleum Gases

NATIONAL SANITATION FOUNDATION (NSF)

NSF Std 14	(Oct 1965; Rev Dec 1988) Plastic Piping Components and Related Materials

1.2 GENERAL REQUIREMENTS

1.2.1 Welding

Piping shall be welded in accordance with qualified procedures using Performance qualified welders and welding operators. Procedures and welders shall be qualified in accordance with Section IX of ASME-17. Welding procedures qualified by others, and welders and welding operators qualified by another employer may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified at least 24 hours in advance of tests and the tests shall be performed at the work site if practicable. The Contracting Officer shall be furnished with a copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators. The welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record.

1.2.2 Standard Products

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Asbestos or products containing asbestos shall not be used. Manufacturer's descriptive data and installation instructions shall be submitted for approval for compression-type mechanical joints used in joining dissimilar materials and for insulating joints. Valves, flanges and fittings shall be marked in accordance with MSS SP-25.

1.2.3 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS.

SD-01 Data

Components and Equipment Data; GA; ED

Manufacturer's catalog data, at least 5 weeks prior to beginning construction, shall be highlighted to show model #, size, options, performance charts and curves, etc. in adequate detail to demonstrate compliance with contract requirements. Data shall include manufacturer's recommended installation instructions and procedures. Data shall be adequate to demonstrate compliance with contract requirements for the following:

a. Piping Components

b. LPG System Components

c. Hangers and Supports

d. Sealant

e. Fire Protection Components

f. Valves

SD-04 Drawings

LP-Gas Piping System; GA

The General Contractor is responsible for submitting coordination drawings for underground systems.

Submit drawings, at least 5 weeks prior to beginning construction. The drawings shall provide adequate detail to demonstrate compliance with contract requirements and the airframe oriented with it's nose due west and in-line and pointing at the control tower and the valve pit located correctly per the geometric plan (Dwg CC-1). Drawings shall consist of:

a. Equipment layouts which identify assembly and installation details.

b. Piping layouts which identify all pipe sizes, valves and fittings and supports.

c. Foundation drawings, bolt-setting information, and foundation bolts prior to concrete foundation construction for all equipment indicated or required to have concrete foundations.

d. Details, if piping and equipment are to be supported other than as indicated, which include loadings and type of frames, brackets, stanchions, or other supports.

SD-06 Instructions

Posted Instructions; GA; CD/OD.

Posted instructions, at least 2 weeks prior to construction completion, shall include equipment layout, wiring and control diagrams, piping, valves and control sequences, and typed condensed operation instructions. The condensed operation instructions shall include preventative maintenance procedures, methods of checking the system for normal and safe operation, and procedures for safely starting and stopping the system. The posted instructions shall be framed under glass or laminated plastic and be posted where indicated by the Contracting Officer.

SD-07 Schedules

Tests; GA; CD/OD.

Test schedules, at least 2 weeks prior to the start of related testing, for each of the field tests. The schedules shall identify the date, time, and location for each test. Testing shall include the following:

a. LP-Gas System.

b. LP-Gas System Pressure and Flow Tests.

c. Cooling System Piping

d. Water jacket piping and water jackets

SD-13 Certificates

LP-Gas System; GA; ED.

Where the system, components, or equipment is specified to comply with requirements of NFPA, ASME, or UL, proof of such compliance shall be provided. The label or listing of the specified agency shall be acceptable evidence. In lieu of the label or listing, a written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency may be submitted.

Qualifications; GA; CD/OD.

Six copies of qualified procedures, and list of names and identification symbols of qualified welders and welding operators, prior to non-factory welding operations.

SD-19 Operation and Maintenance Manuals

Maintenance Manual; FIO

Operations and Maintenance Manuals shall be submitted in accordance with the requirements of Specification SECTION: C-01800, EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS.

Six complete copies of an operation manual in bound 8 1/2 by 11-inch booklets listing step-by-step procedures required for system startup, operation, and shutdown. The booklets shall include the manufacturer's name, model number, and parts list. The manuals shall include the manufacturer's name, model number, service manual, and a brief description of all equipment and their basic operating features. The manuals shall include piping and equipment layouts and simplified wiring and control diagrams of the system as installed.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

2.1.1 Steel Pipe

Black steel in accordance with ASTM A 53, Schedule 40 and 80, threaded ends for sizes 2 inches and smaller for Schedule 40 and socket welded for Schedule 80 (LPG use), larger than 2 inches plain end beveled for butt welding. LPG (liquid and vapor) shall be schedule 80.

2.1.2 Socket-Welding Fittings

ANSI B16.11, forged steel, 300# Class.

2.1.3 Butt-Welding Fittings

ASME B16.9, with backing rings of compatible material.

2.1.4 Unions

ASME B16.39, black malleable all iron, 300# Class.

2.1.5 Flanges And Flanged Fittings

ASME B16.5 steel flanges, 150# Class.

2.1.6 Plastic Pipe and Fittings (Piping less than 3 inch)

Plastic PVC pipe Sch. 80 (for water piping only), fittings, and solvent cement shall meet NSF Std 14 and be NSF listed for the service intended. Plastic pipe fittings, and solvent cement used for potable cold water service shall bear the NSF seal "NSF-PW". Piping shall be approved for fire water services with working pressure not less than 175 psi cold water pressure.

2.1.6.1 Fittings

Joints shall conform to ASTM D 2564 and ASTM D 2855 for plastic solvent cement for PVC plastic pipe.

2.2 VALVES, GENERAL, WATER SERVICE

Steel body, suitable for working pressure of ANSI Class 150 1.89 MPa (275 psig at 100 degrees F), or AWWA Class 200 as required, with weatherproof housing designed to exclude driving train for worm-gear operators. Flanged end connections, or PVC end connection as required for the application. Viton or Teflon with metal backup seals. Provide valve of same manufacturer throughout

where possible. Provide valves with manufacturer's name and pressure rating clearly marked on the outside of the body.

2.2.1 Valve Connections

a. Provide valves suitable to connect to adjoining piping as specified for pipe joints.

b. Thread pipe sizes: 2 inches and smaller.

c. Flange pipe sizes: 2 1/2 inches and larger.

d. PVC ends pipe sizes: 2 inches and larger.

2.2.2 Gate Valves (Shutoff Valves)

a. Two inches and smaller: ANSI Class 150, all iron, wedge-disc or double-disc type, rising stem, outside screw and yoke, screwed ends, suitable for a minimum working pressure of 150 psi (cold, nonshock).

b. Two and one-half inches and larger: ANSI Class 150, all iron, wedge-disc or double-disc type, rising stem, outside screw and yoke, flanged ends, suitable for a minimum working pressure of 125 psi cold, nonshock.

c. Underground valves 2 inches and larger: AWWA Class 200, all iron, wedge-disc or double-disc type, nonrising stem, flanged ends or PVC ends as required, suitable for minimum working pressure 200 psi cold, nonshock.

2.2.3 Check Valve

MS MIL-V-18436, Type III, Class 150, swing check-flanged.

2.2.4 Ball Valves

4 inch and smaller: MSS SP-72, class 150; 150 psi CWP, ASTM B584 bronze body and bonnet. 2 piece construction, chrome plated brass bell, blow-out proof, bronze and brass stem. Teflon seats and seals, steel handwheel, UL listed.

2.2.5 Butterfly Valve

MSS SP-67, 200 psi CWP, ASTM A 126 cast iron body and bonnet, extended neck, stainless steel stem, field replaceable EPDM or Buna N Sleeve and stem seals, lug style with handle, nickel plated ductile iron disc, standard lever handle, UL listed.

2.3 REDUCED-PRESSURE-PRINCIPAL BACKFLOW PREVENTER

Reduced pressure zone epoxy coated assembly shall comply with ASSE 1013, FM, UL listed. The assembly shall have a FDA approved cast-iron body with flanged ends and bronze seats. The assembly shall include OS&Y shutoff valves on the inlet and outlet, 2-positive-seating check valve for continuous pressure application, and strainer on inlet, four test cocks and pressure-differential relief valve with ASME A 112.1.2 air gap fitting located between two positive seating check valves. Provide FDA approved epoxy coated cast iron relief valves with stainless steel trim. Assemblies shall be rated for working pressure of 175 psi. The maximum pressure loss shall be 11 psi at a flow rate equal to the cooling water demand, at the location of the assembly.

a. The Contractor shall file and prepare all Applications for Backflow Preventers in accordance with Regulation 310 CMR 22.22, approval with the Department of Environmental Protection, and pay all fees and charges.
b. All backflow preventers shall be installed in accordance with Regulation 310 CMR 22.22.
c. All certificates of approval and test results shall be sent to the Contracting Officer.

2.4 SOLENOID VALVE

Brass body with bune “N” valve seat, 2-way normally closed operation, with solenoid enclosure rated for NEC Class 1, Division 2, 300 psi safe body pressure, 5 psi minimum operating pressure differential, for use up to 150 degF. Size as indicated.

2.5 VALVES, BELOW-GROUND, LP-GAS SERVICE

Globe or angle valves, ductile iron, with threaded or flanged ends, spring loaded, TFE packing valve disc.

2.6 VALVES, ABOVE-GROUND, LP-GAS SERVICE

2.6.1 Globe Valve

Ductile iron body rated for a minimum 250 psig WOG with threaded or flanged ends, spring loaded, TFE packing and slip joint valve disc.

2.6.2 Angle Valve

Ductile iron body rated for a minimum 250 psig WOG with threaded or flanged ends, spring loaded, TFE packing and slip joint valve disc.

2.6.3 Emergency Shut-Off Valve

Designed for in-line installation. Complete with integral fusible element, designed for manual cable release as indicated on the drawings, poppet, synthetic rubber seat disc, TFE-graphite packing and provided with metal back-up seals for all seats and seals. Valve body made of ductile iron rated for 400 psig WOG. The valve provides a means of shutting off gas in the event of a pipe break.

2.6.4 Backflow Check Valve

Ductile iron body rated for a minimum 250 psig WOG, plated steel or stainless steel body internal parts, synthetic rubber seat disc. Provide with flow indicator.

2.6.5 Ball Valve

Metallic ball valves rated for a minimum 250 psig WOG, ANSI B16.33 corrosion-resisting steel, with threaded or flanged ends. Seat material shall be polytetraflouoroethlene (PTFE).

2.6.6 Pressure Regulator Valve

MS MIL-V-18500, Type II (psig to psig reduction), spring-loaded diaphragm pressure regulator, pressure operating range as required for the pressure indicated, and threaded ends for sizes 2 inches and smaller, otherwise flanged. Valve shall be suitable for a minimum working pressure of 250 psig.

Each regulator is suitable for both vapor and liquid service. Available manufacturers are Fisher, Rego or approved equal.

2.6.7 Excess Flow Valve

Brass body rated for 400 psig WOG and 200 GPM, to close upon excessive discharge of vapor or liquid with built-in equalizing passage. U.L. rated for LP-gas.

2.6.8 Solenoid Valve (up to 1 inch pipe size)

Brass body with buna "N" valve seat, 2-way normally closed operation, with solenoid enclosure rated for NEC Class 1, Division 1, 300 psi safe body pressure, 5 psi minimum operating pressure differential, for use up to 150 deg. F, sizes as indicated.

2.6.9 Hydrostatic Relief Valves

Provide external hydrostatic pressure relief valve of setting 450 psig. Manufacturer is Fisher or approved equal.

2.7 PIPE THREADS

Pipe threads shall conform to ASME B1.20.1.

2.7.1 Sealants for Steel Pipe Threaded Joints

Joint sealing compound shall be listed in UL-06, Class 20 or less. Tetrafluoroethylene tape shall conform to MS MIL-T-27730.

2.8 NAMEPLATES

All equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

2.9 FLANGE GASKETS

Fluorinated elastomer, compatible with grooves in flange faces. Suitable for 1000 deg F.

2.10 WATERTIGHT SEAL

Watertight seal at LPG penetration of engine housing shall be a firestop sealant, in cartridge form, applied at such penetration to effect a seal resistant to water and heat. The sealant shall conform to ASTM E 814/UL 1479 for temperature/water exposure.

Suggested Products:
- Hilti “FS 601” or “FS 605”
- Specified Technologies, Inc. “Pensil 100”
- Tremco “Frye-SIL G6” “Frye-SIL LL” or “Fyre-Shield”

2.11 WELDING FILLER METAL

ANSI B31.2.

2.12 BOLTING (BOLTS AND NUTS)

Stainless Steel bolting; ASTM A 193, Grade B8M or B8MA, Type 316, for bolts; and ASTM A 194, Grade 8M, Type 316, for nuts. Dimensions of bolts, studs, and nuts shall conform to ANSI B18.2.1 and B18.2.2 with threads conforming to ANSI B1.1 coarse type, with class 2A fit for bolts, studs, and class 2B fit for nuts. Bolts or bolt-studs shall extend completely through the nuts and may have reduced shanks of a diameter not less than the diameter at root threads. Bolts shall have American Standard regular square or heavy hexagon heads; nuts shall be American Standard semi-finished hexagonal.

2.13 BURIED UTILITY WARNING AND IDENTIFICATION TAPE

Polyethylene plastic tape manufactured specifically for warning and identification of buried utility lines. Tape shall be the type provided in rolls, 6 inches minimum width, color-coded for natural gas (yellow) with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be "Caution Buried Gas Line Below" or similar wording. Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in trench backfill material.

2.14 IDENTIFICATION FOR ABOVE GROUND PIPING

Labels for pipes 3/4 inch OD and larger shall bear printed legends to identify contents of pipes and arrows to show direction of flow. Labels shall have color-coded backgrounds to signify levels of hazard in accordance with MIL-STD-101B. Legend, type, and size of characters shall also conform with MIL-STD-101B. Labels shall be made of plastic sheet per CID A-A-1689 with pressure-sensitive adhesive suitable for the intended application or they may be pre-molded of plastic to fit over specific pipe outside diameters 2 inches and larger. For pipes smaller than 3/4 inch O.D., furnish brass identification tags 1-1/2 inches in diameter with legends in depressed black-filled characters.

2.15 ABOVE GROUND LP GAS STORAGE TANK

LP gas tank shall be constructed in accordance with the ASME Boiler and Pressure Vessel Code, Section 8, Division 1, for design pressure of 250 psig and with fittings, gauges, relief valves and other appurtenances as required by NFPA 58. The tank shall have grounding lugs near the base of the tank. Lugs shall be bonded with thermic welding.

2.15.1 Relief Valve

Relief valve shall be of the multi-port type allowing for removal of one relief valve at a time for testing. Multi-port relief valve size shall be in accordance with NFPA 58. Fisher H500-250 or approved equal.

2.15.2 Gauges and Fittings

2.15.2.1 Rotary Gauge

Fisher J31L-1 or approved equal.

2.15.2.2 Liquid Level Vent Valve

A combination valve with a pressure gauge and fixed liquid level bleeder valve. The combination valve shall screw into a fitting in the tank, which terminates at the maximum allowable filling level which are approximately 80%. Fisher J415-2 or approved equal.

2.15.2.3 Temperature Gauge

Temperature gauge well, installed in the lower 1/3 of the tank, with a temperature gauge having a range of not less than minus 50 to 150 degF.

2.15.2.4 Vapor Connections

Each vapor connection on the tank shall be equipped with an excess flow valve, and manual shut-off valve sized to fit the openings in the tank and sized for an appropriate flow rate. Vapor openings which are installed in the bottom of the tank shall be factory equipped with a riser pipe, inside the tank, terminating at a position approximately 3 inches below the inside top of the tank, properly supported and welded at the bottom to be leak free.

2.15.2.5 Liquid Connections

Liquid connections shall be equipped with excess flow valve, globe valve with integral hydrostatic relief.

2.15.2.6 Flow Meter

Furnished and installed by the contractor. Flow meter shall be of the one-way, continuous flow, positive displacement type with vapor release and constructed for LP gases. Meter shall have ANSI Class 300 flanges and a body working pressure of not less than 400 psig at 100 deg F. Housing, rotors, and rotor shaft shall be type 316 stainless steel. Bearings shall be carbon steel. Meter seals shall be Viton or Buna. Meter shall be calibrated for liquefied petroleum gas and shall register in gallons. The register shall have a non-setback total indicator and a setback type run indicator so that individual runs can be registered without affecting the total of all runs as shown on the indicator. The total indicator shall have a minimum of six figures. The smallest unit of indicated delivery shall be one gallon. Accuracy shall be within +/- 0.50%. Available manufacturer is Schlumberger or approved equal.

2.15.3 Cleaning and Painting

The new LPG tank shall be cleaned and painted with one coat of primer at the factory. Prior to applying primer coat, loose mill scale shall be removed by wire brushing.

2.15.4 Placing Tank

When placing the tank in the saddles a rust preventing type paint or asphalt impregnated building paper or felt, shall be placed between the saddles and the tank. Installation shall be in accordance with NFPA 58.

2.15.5 Finishing

After the installation of all piping, and preferably prior to initial filling of the tank, the prime coat shall be touched up as necessary, and finish coat of white industrial enamel shall be applied.

2.16 TRUCK TRANSPORT UNLOADING STATION

Station shall comply with NFPA 58. A truck transport unloading facility shall be provided to unload truck transported LP gas. The unloading station bulkhead shall be fabricated from steel channels and/or pipe with the vertical columns poured into the concrete foundations in accordance with the manufacturer's recommendations. The station shall provide for one (1) 1-3/4 inch vapor connection and one (1) 3-1/4 inch liquid connection. The liquid connection shall include a backflow check valve and the vapor connection shall include an

emergency shut-off valve as indicated on the drawings. Both liquid and vapor lines also shall have a manual shut-off valve. A hydrostatic relief valve shall be provided between any two shut-off valves on the liquid service.

2.17 PANEL FANS

Fans shall be propeller types, assembled on a reinforced metal panel with venturi opening spun into panel. Fans with wheels less than 24 inches diameter shall be direct or V-belt driven and fans with wheels 24 inches in diameter and larger shall be V-belt drive type. Fans shall be furnished with wall mounting collar. Lubricated bearings shall be provided. Fans shall be corrosion-resistant finish. Motor enclosure shall be drip proof type. Gravity backdraft dampers shall be provided where indicated.

2.18 COOLING SYSTEM

A water spray fixed system shall be designed, installed, flushed and tested according to the requirements of NFPA -15 for airframe. Galvanized steel pipe Schedule 40, ASTM A53, ASTM A135 shall be used for above ground piping. All piping and fittings shall be of a type specifically approved for fire protection system and of a design suitable for the working pressure involved but not less than 175 psi cold water pressure.

Piping shall be joined by welding. A welding procedure shall be prepared and qualified before any welding is done. Piping support shall be galvanized. All valves shall be of a type approved for the purpose. Nozzles shall be installed on the areas of the source of fire and shall not be less than 0.5 GPM per Sq. Ft.

The selection of the type and size of spray nozzles should be based on character of the hazard involved, draft or wind conditions, materials likely to be burning and the general purpose of the system. The nozzles shall be chrome plated or brass finished. The nozzles shall be designed for water spray fixed system per NFPA - 15 and for the hazardous installation, approved by UL, FM and maximum working pressure 175 psi.

2.18.1 Open Head Cooling System at LPG Tank

A cooling system shall be designed, installed and tested according to the requirements of NFPA-58 and local fire department. The system will consist of open head sprinklers and a free standing fire department connection. The system will be dry and will be tied with firefighter pumpers in case of need. All piping and fittings will be of ductile-iron and/or malleable iron approved for fire protection system and of a design suitable for the working pressure not less than 175-psi cold water pressure for underground piping. Piping shall be joined by welding. The piping above ground will be of galvanized steel Schedule 40 ASTM A53 or ASTM A135. Sprinkler will be nominal 1/2 inch orifice for "Extra Hazard" classification rating. Sprinklers will be open type, UL 199, without heat responsive element, brass finish.

2.19 NITROGEN GAS STORAGE TANKS

Provide and install four 224 SCF cu ft.tanks filled with nitrogen. The contractor shall provide the nitrogen during testing and shall provide four filled tanks at acceptance.

PART 3 EXECUTION

3.1 INSTALLATION

Install gas piping, appliances and equipment in accordance with ANSI B31.2.

3.1.1 Excavating and Backfill

Excavating and backfilling of pipe trenches shall be as specified in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES. Pipe shall be placed directly in the trench bottom and covered by not less than 3 inches of sand above the level of the top of the pipe except that, if the trench bottom is rocky, the pipe shall be placed in a 3 inch or more bed of sand and covered as above unless otherwise indicated. Coordinate provision of utility warning and identification tape with backfill operation. Tape shall be provided above all buried lines at a depth of 8 to 12 inches below finish grade.

3.1.2 Piping

Cut pipe accurately to actual dimensions and assemble to prevent residual stress. Terminate each vertical supply pipe to burner or appliance with tee, nipple and cap to form a sediment trap. To supply multiple items of gas-burning equipment, provide manifold with inlet connections at both ends.

3.1.2.1 Cleanliness

Clean inside of all pipe and fittings before installation. Blow lines clear using 80-to-100 psig clean dry compressed air. Rap steel lines sharply along entire pipe length before blowing clear. Cap or plug pipe ends to maintain cleanliness throughout installation.

3.1.2.2 Above Ground and Below Ground Steel Piping

Determine and establish measurements for piping at the job site and accurately cut pipe lengths accordingly. For 2-inch diameter and smaller, use threaded or socket-welded joints. For 2-1/2 inch diameter and larger, use flanged or butt-welded joints.

a. Threaded Joints: Where possible use pipe with factory-cut threads, otherwise cut pipe square, remove all fins and burrs, and cut taper pipe threads per ANSI B.1.20.1 Threads shall be smooth, clean and full-cut. Apply anti-seize paste or tape to male threads portion, which contains the securing nuts. Work piping into place without springing of forcing. Backing off to permit allotment of threaded joints will not be permitted. Engage threads so that not more than three threads remain exposed. Use unions for connections to meter for which a means of disconnection is not otherwise provided.

b. Welded Joints: Weld by the shielded metal-arc process, using covered electrodes and in accordance with procedures established and qualified in accordance with ANSI B31.2 qualification test report. Contractor shall conduct the ANSI qualification tests. In addition, submit each welder's assigned number, letter, or symbol used to identify the work of the welder. Affix symbols immediately upon completion of welds. Welders making defective welds after passing a qualification test shall

be given a requalification test and, upon failing to pass this test, shall not be permitted to work this contract.

c. Flanged Joints: Use flanged joints for connecting welded joint pipe and fittings to valves to provide for disconnection. Install joints so that flange faces bear uniformly on gaskets. Engage bolts so that there is complete threading through the nuts and tighten so that bolts are uniformly stressed and equally torqued.

d. Pipe Size Changes: Use reducing fittings for changes in pipe size. Size changes made with bushings will not be accepted.

e. Painting: Paint all new above ground ferrous metal piping, including supports, and aboveground electrical conduit in accordance with Section 09900 PAINTING. Do not apply paint until piping tests have been complete.

f. Identification of piping: Identify piping above ground in accordance with MIL-STD-101B, using adhesive-backed or snap-on plastic labels and arrows. In lieu of labels, identification tags may be used. Apply labels or tags to finished paint at intervals of not more than 50 feet. Provide two copies of the piping identification code framed under glass and install where directed.

3.1.2.3 Below Ground Plastic Piping

Piping shall be installed as indicated. Pipe shall be accurately cut and worked into place without springing or forcing. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted. PVC pipe shall have joints made with solvent cement elastomeric, threading, (threading of Schedule 80 Pipe is allowed only where required for disconnection and inspection; threading of Schedule 40 Pipe is not allowed).

3.1.3 Valves

a. Install valves approximately at locations indicated. Orient stems vertically (with operators on top) or horizontally as required.

3.1.4 Hangers and Supports

a. Selection, fabrication and installation of piping hangers and supports shall conform with MSS SP-69, except that spacing of the hangers and supports shall comply with Table I. Anchoring shall be as indicated.

Hangers and supports shall be provided and fabricated for use in Seismic Zone #2.

TABLE I
MAXIMUM SPAN FOR PIPE

DIAMETER INCHES	STD. WT. STEEL PIPE 40 S FEET
1/2	5'- 0"
3/4	5'- 9"
1	6'- 6"
1-1/2	7'- 6"
2	8'- 6"
2-1/2	9'- 3"

3 10'- 3"

3.1.5 Final Connections

Make final connections to all equipment and appliances using rigid pipe and fittings. Connections shall be gas-tight, using minimal torque.

3.2 PIPE COATINGS

Coating and protection of ferrous piping shall be as specified in Section 16642 CATHODIC PROTECTION SYSTEM IMPRESSED CURRENT.

3.3 PIPE JOINTS

Pipe joints shall be designed and installed to effectively sustain the longitudinal pullout forces caused by contraction of the piping or superimposed loads.

3.3.1 Threaded Metallic Joints

Threaded joints in metallic pipe shall have tapered threads evenly cut and shall be made with UL approved graphite joint sealing compound for gas service or tetrafluoroethylene tape applied to the male threads only. After cutting and before threading, pipe shall be reamed and burrs shall be removed. Caulking of threaded joints to stop or prevent leaks shall not be permitted.

3.3.2 Welded Metallic Joints

Beveling, alignment, heat treatment, and inspection of welds shall conform to ASME B31.2. Weld defects shall be removed and repairs made to the weld, or the weld joints shall be entirely removed and rewelded. After filler metal has been removed from its original package, it shall be protected or stored so that its characteristics or welding properties are not affected adversely. Electrodes that have been wetted or have lost any of their coating shall not be used.

3.4 PIPE SLEEVES

Pipes passing through concrete or masonry walls or concrete floors shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves shall not be installed in structural members except where indicated or approved. Each sleeve shall extend through its respective wall, floor or roof, and shall be cut flush with each surface. Unless otherwise indicated, sleeves shall be large enough to provide a minimum clearance of 1/4 inch all around the pipe. Sleeves shall be schedule 40 steel pipe. The annular space between pipe and sleeve shall be sealed with backstop material and sealant.

3.5 CONTROL TOWER STRUCTURE

Building structure shall not be weakened by the installation of any gas piping. Beams or joists shall not be cut or notched.

3.6 PIPING SYSTEM SUPPORTS

Gas piping shall be supported with pipe hooks, metal pipe straps, bands or hangers suitable for the size of piping or tubing. Gas piping shall not be supported by other piping. Spacing of supports in gas piping shall conform to the requirements of MSS SP-69. In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the

base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for any of the individual pipes in the multiple pipe run. The clips or clamps shall be rigidly connected to the common base member. A clearance of 1/8 inch shall be provided between the pipe and clip or clamp for all piping which may be subjected to thermal expansion.

3.7 ELECTRICAL BONDING AND GROUNDING

Piping shall be electrically continuous and bonded to a grounding electrode as specified in Section 16642 CATHODIC PROTECTION SYSTEM IMPRESSED CURRENT.

3.8 CATHODIC PROTECTION

Cathodic protection shall be provided for underground ferrous piping as specified in Section 16642 CATHODIC PROTECTION SYSTEM IMPRESSED CURRENT.

3.9 FIELD QUALITY CONTROL

3.9.1 Metal Welding Inspection

Inspect for compliance with NFPA 54. Replace, repair, and then re-inspect defective welds.

3.10 TESTING

3.10.1 LP Gas Pressure Tests

Before any section of a gas piping system is put into service, it shall be carefully tested to assure that it is gastight. Prior to testing, the system shall be blown out, cleaned and cleared of all foreign material. Each joint shall be tested by means of an approved gas detector, soap and water, or an equivalent nonflammable solution. Testing shall be completed before any work is covered, enclosed, or concealed. All testing of piping systems shall be done with due regard for the safety of employees and the public during the test. Bulkheads, anchorage and bracing suitably designed to resist test pressures shall be installed if necessary. Oxygen shall not be used as a testing medium.

3.10.1.1 Pressure Tests

Use test pressure of 1-1/2 times maximum working pressure, but in no case less than 150 psig. Do not test until every joint has set and cooled at least 8 hours at temperatures above 50 degF. Test system gas tight in accordance with NFPA 54. Use clean dry air or inert gas, such as nitrogen or carbon dioxide, for testing. Systems which may be contaminated by gas shall first be purged as specified. Make tests on entire system or on sections that can be isolated. Maintain test pressure for at least 8 hours between times of first and last reading of pressure and temperature. Take first reading at least one hour after test pressure has been applied. Do not take test readings during rapid weather changes. Allow for ambient temperature change in accordance with the relationship PF + 14.7 = (P1 + 14.7) (T2 + 460) / T1 + 460), in which "T" and "PF" represent Fahrenheit temperature and gauge pressure, respectively, subscripts "1" and "2" denote initial and final readings, and "PF" is the calculated final pressure. If "PF" exceeds the measured final pressure (final gauge reading) by 1/2 psi or more, isolate sections of the piping system, retest each section individually, and apply a solution of warm soapy water to joints of each section for which a reduction in pressure occurs after allowing for ambient temperature change. Repair leaking joints and repeat test until no reduction in pressure occurs. In performing tests, use a test gauge calibrated in one-psi increments and readable to 1/2 psi.

3.10.1.2 Initial Fill

Regardless of how much pressure is used in the preliminary test, leaks which were not evident during the test may become, or even created, during the initial fill of the tanks with LP gas, due to the refrigeration effect which takes place during filling of a tank which is initially at atmospheric pressure. The tank shall first be brought up to delivering truck tank pressure using the LP gas vapor connection. Then check all joints for leaks using a leak detecting soap type solution or any approved leak detection system. Upon verification that the LP tank and associated piping is free from leaks, the tank will be filled by the contractor with LP gas to a minimum of 50% capacity (Approximately 6000 gallons) for operational acceptance testing.

3.10.1.3 Purging

After pressure tests, and before testing a gas-contaminated line, purge line with nitrogen at junction with main line to remove all air or gas. Clear completed line by attaching a test pilot fixture at capped stub-in line at building location and let gas flow until test pilot ignites. All procedures shall conform to ANSI B31.2.

3.10.2 Water Piping Hydrostatic Test

After cleaning and flushing per NFPA-24, water piping shall be Hydrostatically tested at a pressure equal to 150 percent of the total system operating pressure for period of time sufficient to inspect every joint in the system and in no case less than 2 hours. Leaks shall be repaired and piping retested until test is successful. No loss of pressure will be allowed. Leaks shall be repaired by rewelding or replacing pipe or fittings. Caulking of joints will not be permitted. Concealed and insulated piping shall be tested in place before covering or concealing.

3.10.3 Operational Test

Upon completion of and prior to acceptance of the installation, the Contractor shall subject the airframe LP gas and airframe cooling systems to operating tests to demonstrate satisfactory functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include a report with conclusion as to the adequacy of the systems. The report of the test shall be submitted in quadruplicate. The Contractor shall furnish instruments, equipment, and personnel required for the tests; the Government will furnish the necessary water, and electricity. Refer to operational test criteria in specifications, section 01440 "Contractor Quality Control".

3.11 LABOR, MATERIALS AND EQUIPMENT

All labor, materials and equipment necessary for conducting the testing and purging shall be furnished by the Contractor.

3.13 FIELD EQUIPMENT TEST

After installation of the pumping unit and appurtenances is complete, operating tests shall be carried out to assure that the pumping installation operates properly. Each pumping unit shall be given a running field test in

the presence of the Contracting Officer for a minimum of 2 hours. Each pumping unit shall be operated at its rated capacity or such other point on its head-capacity curve selected by the Contracting Officer. The Contractor shall pump an accurate and acceptable method of measuring the discharge flow. Tests shall assure that the unit and appurtenances have been installed correctly, that there is no objectionable heating, vibration, or noise from any parts, and that all manual and automatic controls function properly. If any deficiencies are revealed during any tests, such deficiencies shall be corrected and the tests shall be reconducted.

3.14 STEEL FUEL STORAGE TANK

Storing, handling, and placing of coated steel tank shall be done with care and in a manner that will minimize damage to the coating and will not reduce its protective value. Coated tank shall be placed in position carefully and with a minimum of handling. All damaged surfaces shall be repaired and tested as specified before backfilling. Steel tanks shall be installed in accordance with the manufacturer’s written instructions and NFPA 58.

END OF SECTION 15492

SECTION 16375 - ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C2	(1993; TIA 90-2; Errata) National Electrical Safety Code
ANSI C80.1	(1990) Rigid Steel Conduit-Zinc Coated
ANSI C119.1	(1986) Sealed Insulated Underground Connector Systems Rated 600 Volts
ANSI C135.30	(1988) Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 48	(1983; R 1990) Gray Iron Castings
ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153	(1982; R 1987) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM B 8	(1990) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B 117	(1990) Salt Spray (Fog) Testing
ASTM D 1654	(1979a; R 1984) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM F 883	(1990) Padlocks

FACTORY MUTUAL ENGINEERING AND RESEARCH CORPORATION (FM)

FM P7825	(1992; Supple I, II, and III) Approval Guide

FEDERAL SPECIFICATIONS (FS)

FS HH-I-595	(Rev C) Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic
FS W-S-610	(Rev E; Notice 1) Splice Connectors

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)

IEEE C37.90.1	(1989) Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems

IEEE C37.98	(1987; R 1991) Seismic Testing of Relays
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System IEEE Std 100 (1988; 4th Ed) IEEE Standard Dictionary of Electrical and Electronics Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA FB 1	(1988) Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
NEMA TC 6	(1990) PVC and ABS Plastic Utilities Duct for Underground Installation
NEMA WC 7	(1988) Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA WC 8	(1988) Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1996) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 6	(1981; Rev thru Jul 1991) Rigid Metal Conduit
UL 467	(1984; Rev thru Nov 1986) Grounding and Bonding Equipment
UL 486A	(1991; Rev Oct 1991) Wire Connectors and soldering Lugs for Use with Copper Conductors
UL 486B	(1991; Rev Oct 1991) Wire Connectors for Use with Aluminum Conductors
UL 514A	(1991) Metallic Outlet Boxes
UL 651	(1989; Rev thru Dec 1989)Schedule 40 and 80 Rigid PVC Conduit
UL 1242	(1983; Rev thru Jun 1991)Intermediate Metal Conduit

1.2 GENERAL REQUIREMENTS

1.2.1 Terminology

Terminology used in this specification is as defined in IEEE Std 100.

1.3 SUBMITTALS

Governmental approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Short-Circuit and Protective Devices Coordination Studies; GA; ED.
Studies which demonstrate that the equipment selected and system constructed meet the contract requirements for equipment ratings, coordination, and protection. The studies shall include a complete single-line diagram of the power system covered by this specification; a short circuit study including the maximum and minimum values of short circuit currents at major buses extended down to system buses where currents are equal to 10,000 amperes symmetrical; fully coordinated composite time-current characteristic curves including recommended ratings and settings of all protective devices in tabulated form; and associated calculations to demonstrate that the power system protection will be selectively coordinated by the use of devices or equipment submitted. Situations where system coordination is not achievable due to device limitations shall be noted. The studies shall be performed by a registered professional engineer with demonstrated experience in power system coordination in the last three years. The Contractor shall provide a list of references complete with points of contact, addresses and telephone numbers. The selection of the engineer is subject to the approval of the Contracting Officer.
Manufacturer's Catalog Data; FIO

Catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

Material, Equipment, and Fixture Lists; GA

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each such item.

Installation Procedures; FIO

As a minimum, installation procedures for transformers, substations, switchgear, and medium-voltage cable terminations and splices.

Procedures shall include cable pulling plans, diagrams, instructions, and precautions required to install, adjust, calibrate, and test the devices and equipment.

SD-04 Drawings

Electrical Distribution System; GA

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams manufacturers standard installation drawings and other information necessary to define the installation and enable the Government to check conformity with the requirements of the contract drawings.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures shall be included with the detail drawings. Approved departures shall be made at no additional cost to the Government.

Detail drawings shall show how components are assembled, function together and how they will be installed on the project. Data and drawings for component parts of an item or system shall be coordinated and submitted as a unit. Data and drawings shall be coordinated and included in a single submission. Multiple submissions for the same equipment or system are not acceptable except where prior approval has been obtained from the Contracting Officer. In such cases, a list of data to be submitted later shall be included with the first submission. Detail drawings shall consist of the following:

a. Detail drawings showing physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit or busway entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, and equipment weight. Drawings shall be drawn to scale and/or dimensioned. All optional items shall be clearly identified as included or excluded.

b. Internal wiring diagrams of equipment showing wiring as actually provided for this project. External wiring connections shall be clearly identified.

As-Built Drawings; FIO

The as-built drawings shall be a record of the construction as installed. The drawings shall include all the information shown on the contract drawings as well as all deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be a full sized set of prints marked to reflect all deviations, modifications, and changes. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control representative and by the Contracting Officer prior to the submission of each monthly pay estimate. Upon completion of the work, the Contractor shall submit three full sized sets of the marked prints to the Contracting Officer for approval. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction. The Contractor shall correct and return the as-built drawings to the Contracting Officer for approval within ten calendar days from the time the drawings are returned to the Contractor.

SD-09 Reports

Factory Test; FIO

Certified factory test reports shall be submitted when the manufacturer performs routine factory tests, including tests required by standards listed in paragraph REFERENCES. Results of factory tests performed shall be certified by the manufacturer, or an approved testing laboratory, and submitted within 7 days following successful completion of the tests specified in applicable publications or in these specifications. The manufacturer's pass-fail criteria for tests specified in paragraph FIELD TESTING shall be included.

Field Testing; FIO

A proposed field test plan, 20 days prior to testing the installed system. No field test shall be performed until the test plan is approved. The test plan

shall consist of complete field test procedures including tests to be performed, test equipment required, and tolerance limits.

Test Reports; FIO

Six copies of the information described below in 8 1/2 by 11 inch binders having a minimum of 5 rings from which material may readily be moved and replaced, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

a. A list of all equipment used, with calibration certifications.

b. A copy of all measurements taken.

c. The dates of testing.

d. The equipment and values to be verified.

e. The condition specified for the test.

f. The test results, signed and dated.

g. A description of all adjustments made.

Cable Installation Reports; FIO

Six copies of the information described below in 8 1\2 by 11 inch binders having a minimum of 5 rings from which material may readily be removed and replaced, including a separate section for each cable pull. Sections shall be separated by heavy plastic dividers with tabs, with all data sheets signed and dated by the person supervising the pull.

a. Site layout drawing with all cable pulls numerically identified.

b. A list of all equipment used, with calibration certifications. The manufacturer of and quantity of lubricant used on pull.

c. The cable manufacturer and type of cable.

d. The dates of cable pulls, time of day, and ambient temperature.

e. The length of cable pull and calculated cable pulling tensions.

f. The actual cable pulling tensions encountered during pull.

SD-13 Certificates

Materials and Equipment; FIO

Where materials or equipment are specified to conform to the standards of the Underwriters Laboratories (UL) or to be constructed or tested, or both, in accordance with the standards of the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided under this section of the specifications conform to such requirements. The label of, or listing by, UL will be acceptable as evidence that the items conform. Either a certification or a published catalog specification data statement, to the effect that the item is in accordance with the referenced ANSI or IEEE standard, will be acceptable as evidence that the item conforms. A similar certification or published catalog

specification data statement to the effect that the item is in accordance with the referenced NEMA standard, by a company listed as a member company of NEMA, will be acceptable as evidence that the item conforms. In lieu of such certification or published data, the Contractor may submit a certificate from a recognized testing agency equipped and competent to perform such services, stating that the items have been tested and that they conform to the requirements listed, including methods of testing of the specified agencies. Compliance with above-named requirements does not relieve the Contractor from compliance with any other requirements of the specifications.

Cable Installer Qualifications; FIO

The Contractor shall provide at least one onsite person in a supervisory position with a documentable level of competency and experience to supervise all cable pulling operations. A resume shall be provided showing the cable installers' experience in the last three years, including a list of references complete with points of contact, addresses and telephone numbers.

SD-19 Operation and Maintenance Manuals

Electrical Distribution System; FIO

Operation and maintenance manuals shall be submitted in accordance with the requirements of Specification Section: C-01800, EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS.

1.4 DELIVERY, STORAGE, AND HANDLING

Devices and equipment shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced. Oil filled transformers and switches shall be stored in accordance with the manufacturer's requirements.

1.5 EXTRA MATERIALS

One additional spare fuse or fuse element for each furnished fuse or fuse element shall be delivered to the contracting officer when the electrical system is accepted. Two complete sets of all special tools required for maintenance shall be provided, complete with a suitable tool box. Special tools are those that only the manufacturer provides, for special purposes (to access compartments, or operate, adjust, or maintain special parts).

PART 2 PRODUCTS

2.1 STANDARD PRODUCT

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.2 NAMEPLATES

2.2.1 General

Each major component of this specification shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a

nameplate securely attached to the equipment. Nameplates shall be made of noncorrosive metal. Equipment containing liquid dielectrics shall have the type of dielectric on the nameplate. As a minimum, nameplates shall be provided for transformers, circuit breakers, meters and switches.

2.3 CORROSION PROTECTION

2.3.1 Aluminum Materials

Aluminum shall not be used in contact with earth or concrete. Where aluminum conductors are connected to dissimilar metal, fittings conforming to UL 486B shall be used.

2.3.2 Ferrous Metal Materials

2.3.2.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153 and ASTM A 123.

2.3.2.2 Equipment

Equipment and component items, including but not limited to transformer stations and ferrous metal luminaires not hot-dip galvanized or porcelain enamel finished, shall be provided with corrosion-resistant finishes which shall withstand 200 hours of exposure to the salt spray test specified in ASTM B 117 without loss of paint or release of adhesion of the paint primer coat to the metal surface in excess of 1/16 inch from the test mark. The scribed test mark and test evaluation shall be in accordance with ASTM D 1654 with a rating of not less than 7 in accordance with TABLE 1, (procedure A). Cut edges or otherwise damaged surfaces of hot-dip galvanized sheet steel or mill galvanized sheet steel shall be coated with a zinc rich paint conforming to the manufacturer's standard.

2.3.3 Finishing

Painting required for surfaces not otherwise specified and finish painting of items only primed at the factory shall be as specified in Section 09900 PAINTING, GENERAL.

2.4 CABLES

Cables shall be single conductor type unless otherwise indicated. Stranded for sizes No. 8 and larger. Solid for sizes No. 10 and smaller.

2.4.1 Conductor Material

Underground cables shall be of soft drawn copper conductor material.

2.4.2 Low-Voltage Cables

Cables shall be rated 600 volts and shall conform to the requirements of NFPA 70. Cables shall utilize cross-linked thermosetting polyethylene (XLP) insulation and shall conform to the requirements of NEMA WC 7 or ethylene-propylene-rubber (EPR) insulation and shall conform to the requirements of NEMA WC 8.

2.4.2.1 In Duct

Cables shall be single-conductor cable, Type RHW, THW, THWN, TW, USE, or XHHW in accordance with NFPA 70. Cables in factory-installed, coilable-plastic-duct assemblies shall conform to NEMA TC 5 or NEMA TC 7.

2.5 CABLE JOINTS, TERMINATIONS, AND CONNECTORS

2.5.1 Low-Voltage Cable Splices

Low-voltage cable splices and terminations shall be rated at not less than 600 Volts. Splices in conductors No. 10 AWG and smaller shall be made with an insulated, solderless, pressure type connector, Type I, Class 1, Grade B, Style G, or Type II, Class 1 of FS W-S-610 and conforming to the applicable requirements of UL 486A. Splices in conductors No. 8 AWG and larger shall be made with noninsulated, solderless, pressure type connector, Type II, Class 2 of FS W-S-610, conforming to the applicable requirements of UL 486A and UL 486B. Splices shall then be covered with an insulation and jacket material equivalent to the conductor insulation and jacket. Splices below grade or in wet locations shall be sealed type conforming to ANSI C119.1 or shall be waterproofed by a sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring a thermosetting resin into a mold that surrounds the joined conductors.

2.5.2 Terminations

Terminations shall be in accordance with IEEE Std 48, Class 1 or Class 2; of the molded elastomer, wet-process porcelain, prestretched elastomer, heat-shrinkable elastomer, or taped type. Acceptable elastomers are track-resistant silicone rubber or track-resistant ethylene propylene compounds, such as ethylene propylene rubber or ethylene propylene diene monomer. Separable insulated connectors may be used for apparatus terminations, when such apparatus is provided with suitable bushings. Terminations shall be of the outdoor type, except that where installed inside outdoor equipment housings which are sealed against normal infiltration of moisture and outside air, indoor, Class 2 terminations are acceptable. Class 3 terminations are not acceptable. Terminations, where required, shall be provided with mounting brackets suitable for the intended installation and with grounding provisions for the cable shielding, metallic sheath, and armor.

2.5.2.1 Factory Preformed Type

Molded elastomer, wet-process porcelain, prestretched, and heat-shrinkable terminations shall utilize factory preformed components to the maximum extent practicable rather than tape build-up. Terminations shall have basic impulse levels as required for the system voltage level. Leakage distances shall comply with wet withstand voltage test requirements of IEEE Std 48 for the next higher Basic Insulation Level (BIL) level. Anti-tracking tape shall be applied over exposed insulation of preformed molded elastomer terminations.

2.6 CONDUIT

Duct lines shall be concrete-encased, thin-wall type for medium-voltage lines. Low-voltage lines run elsewhere may be direct-burial, thick-wall type.

2.6.1 Metallic Conduit

Intermediate metal conduit shall comply with UL 1242. Rigid galvanized steel conduit shall comply with UL 6 and ANSI C80.1. Metallic conduit fittings and outlets shall comply with UL 514A and NEMA FB 1.

2.6.2. Direct Burial

UL 651 Schedule 40, or NEMA TC 6 Type DB.

2.6.3 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

2.7 HANDHOLES AND PULLBOXES

Handholes and pullboxes shall be as indicated. Covers shall be of steel with lifting handles.

2.8 GROUNDING AND BONDING

2.8.1 Driven Ground Rods

Ground rods shall be copper-clad steel conforming to UL 467 not less than 5/8 inch in diameter by 10 feet in length. Sectional type rods may be used.

2.8.2 Grounding Conductors

Grounding conductors shall be bare, except where installed in conduit with associated phase conductors. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Bare conductors shall be ASTM B 8 soft-drawn unless otherwise indicated. Aluminum is not acceptable.

2.9 CONCRETE AND REINFORCEMENT

Concrete shall be a minimum of 2500 psi at 28 days. All other requirements shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Concrete reinforcing shall be as specified in Section 03200 CONCRETE REINFORCEMENT.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Equipment and devices shall be installed and energized in accordance with the manufacturer's published instructions. Steel conduits installed underground shall be installed and protected from corrosion in conformance with the requirements of Section 16415 ELECTRICAL WORK, INTERIOR. Except as covered herein, excavation, trenching, and backfilling shall conform to the requirements of Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Concrete work shall conform to the requirements of Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of NFPA 70 and ANSI C2 as applicable.

3.1.2 Verification of Dimensions

The Contractor shall become familiar with details of the work, shall verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.

3.2 CABLE AND BUSWAY INSTALLATION

The Contractor shall obtain from the manufacturer an installation manual or set of instructions which addresses such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, etc. The Contractor shall then prepare a checklist of significant requirements perform pulling calculations and prepare a pulling plan which shall be submitted along with the manufacturers instructions in accordance with SUBMITTALS.

3.2.1 Cable Installation Plan and Procedure

Cable shall be installed strictly in accordance with the cable manufacturer's recommendations. Each circuit shall be identified by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, at each terminal.

3.2.1.1 Cable Inspection

The cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable in accordance with the cable manufacturer's recommendations.

3.2.1.2 Cable Installation

The Contractor shall provide a cable feeding truck and a cable pulling winch. The Contractor shall provide a pulling grip or pulling eye in accordance with cable manufacturer's recommendations. The pulling grip or pulling eye apparatus shall be attached to polypropylene or manila rope followed by lubricant front end packs and then by power cables. A dynamometer shall be used to monitor pulling tension. Pulling tension shall not exceed cable manufacturer's recommendations. The Contractor shall not allow cables to cross over while cables are being fed into duct. For cable installation in cold weather, cables shall be kept at 50 degrees F temperature for at least 24 hours before installation.

3.2.1.3 Cable Installation Plan

The Contractor shall submit a cable installation plan for all cable pulls in accordance with the detail drawings portion of paragraph SUBMITTALS. Cable installation plan shall include:

a. Site layout drawing with cable pulls identified in numeric order of expected pulling sequence and direction of cable pull.

b. List of cable installation equipment.
c. Lubricant manufacturer's application instructions.

d. Procedure for resealing cable ends to prevent moisture from entering

cable.

e. Cable pulling tension calculations of all cable pulls.

f. Cable percentage conduit fill.

g. Cable sidewall thrust pressure.

h. Cable minimum bend radius and minimum diameter of pulling wheels used.

i. Cable jam ratio.

j. Maximum allowable pulling tension on each different type and size of conductor.

k. Maximum allowable pulling tension on pulling device.

3.2.2 Duct Line

Cables shall be installed in duct lines where indicated. Neutral and grounding conductors shall be installed in the same duct with their associated phase conductors.

3.3 DUCT LINES

3.3.1 Requirements

Numbers and sizes of ducts shall be as indicated. Duct lines shall be laid with a minimum slope of 4 inches per 100 feet. Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3-inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate in manholes or handholes.

3.3.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

3.3.1 Nonencased Direct-Burial

Top of duct lines shall be not less than 24 inches below finished grade and shall be installed with a minimum of 3 inches of earth around each duct, except that between adjacent electric power and communication ducts, 12 inches of earth is required. Bottoms of trenches shall be graded toward manholes or handholes and shall be smooth and free of stones, soft spots, and sharp

objects. Where bottoms of trenches comprise materials other than sand, a 3 inch layer of sand shall be laid first and compacted to approximate densities of surrounding firm soil before installing ducts. Joints in adjacent tiers of duct shall be vertically staggered at least 6 inches. The first 6-inch layer of backfill cover shall be sand compacted as previously specified. The rest of the excavation shall be backfilled and compacted in 3- to 6-inch layers. Duct banks may be held in alignment with earth. However, high-tiered banks shall use a wooden frame or equivalent form to hold ducts in alignment prior to backfilling.

3.3.2 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the manufacturer's recommendations for the particular type of duct and coupling selected and as approved.

3.3.2.1 Plastic Duct

Duct joints shall be made by brushing a plastic solvent cement on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick 1/4-turn twist to set the joint tightly.

3.3.3 Duct Line Markers

Duct line markers shall be provided as indicated. A 5-mil brightly colored plastic tape, not less than 3 inches in width and suitably inscribed at not more than 10 feet on centers with a continuous metallic backing and a corrosion-resistant 1-mil metallic foil core to permit easy location of the duct line, shall be placed approximately 12 inches below finished grade levels of such lines.

3.4 HANDHOLES

3.4.1 Handholes

Handholes shall be located approximately as shown. Handholes shall be of the types noted on the drawings and shall be constructed in accordance with the details shown.

3.4.2 Ground Rods

A ground rod shall be installed at the handholes. Ground rods shall be driven into the earth before the handholes floor is poured so that approximately 4 inches of the ground rod will extend above the handhole floor.

3.6 GROUNDING

A ground ring consisting of the indicated configuration of bare copper conductors and driven ground rods shall be installed around pad-mounted equipment as shown. Equipment frames of metal-enclosed equipment, and other noncurrent-carrying metal parts, such as cable shields, cable sheaths and armor, and metallic conduit shall be grounded. At least 2 connections shall be provided from a transformer, to the ground mat.

3.6.1 Grounding Electrodes

Grounding electrodes shall be installed as shown on the drawings and as follows:

a. Driven rod electrodes - Unless otherwise indicated, ground rods shall be driven into the earth until the tops of the rods are approximately 1 foot below finished grade.

b. Additional electrodes - Whenever the required ground resistance is not met, provide additional electrodes interconnected with grounding conductors, to achieve the specified ground resistance. The additional electrodes will be up to 3, 20-foot rods spaced a minimum of 10 feet apart a single extension-type rod, 5/8-inch diameter, up to 30 feet long, driven perpendicular to grade.

3.6.2 Grounding and Bonding Connections

Connections above grade shall be made by the fusion-welding process or with bolted solderless connectors, in compliance with UL 467, and those below grade shall be made by a fusion-welding process. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.

3.6.3 Grounding and Bonding Conductors

Grounding and bonding conductors include all conductors used to bond transformer enclosures and equipment frames to the grounding electrode system. Grounding and bonding conductors shall be sized as shown, and located to provide maximum physical protection. Bends greater than 45 degrees in ground conductors are not permitted. Routing of ground conductors through concrete shall be avoided. When concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor, and the opening shall be sealed with a suitable compound after installation.

3.7 FIELD TESTING

3.7.1 General

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 7days prior to conducting tests. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. All field test reports shall be signed and dated by the Contractor.

3.7.2 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

3.7.3 Ground-Resistance Tests

The resistance of each grounding electrode system shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and

shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

a. Single rod electrode - 25 ohms.

b. Multiple rod electrodes - 25ohms.

3.7.4 Low-Voltage Cable Test

Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or cable grounded. The minimum value of insulation shall be:

$$R \text{ in megohms} = \frac{(\text{rated voltage in kV} + 1) \times 1000}{\text{length of cable in feet}}$$

Each cable failing this test shall be repaired or replaced. The repaired cable system shall be retested until failures have been eliminated.

3.7.5 Operating Tests

After the installation is completed, and at such times as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the requirements herein. An operating test report shall be submitted in accordance with SUBMITTALS Test Reports.

3.8 MANUFACTURER'S FIELD SERVICE

3.8.1 Onsite Training

The Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total of 16 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The course instruction shall cover pertinent points involved in operating, starting, stopping, and servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance operations.

3.9 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

END OF SECTION 16375

SECTION 16415 ELECTRICAL WORK, INTERIOR

PART 1 - GENERAL

1.1 SUMMARY (Not Applicable)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C2	(1993) National Electrical Safety Code
ANSI C39.1	(1981) Electrical Analog Indicating Instruments
ANSI C80.5	(1990) Rigid Aluminum Conduit
ANSI C82.4	(1985; C82.4a-1988) Ballasts for High- Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple Supply Type)

FEDERAL SPECIFICATIONS (FS)

FS L-C-530	(Rev C) Coating, Pipe, Thermoplastic Resin
FS L-P-387	(Rev A; Am 1, Int Am 2) Plastic Sheet, Laminated, Thermosetting (for Designation Plates)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(1985; Rev 1 & 2, ICS 6) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA AB 1	(1986; Rev 1) Molded Case Circuit Breakers and Molded Case Switches
NEMA FU 1	(1986) Low Voltage Cartridge Fuses
NEMA ICS 1	(1988; Rev 1 & 2) Industrial Controls and Systems
NEMA ICS 2	(1988; Rev 1) Industrial Control Devices, Controllers and Assemblies
NEMA ICS 3	(1988; Rev 1) Industrial Systems
NEMA ICS 6	(1988; Rev 1) Enclosures for Industrial Control and Systems
NEMA LE 4	(1987) Recessed Luminaires, Ceiling Compatibility

NEMA OS 1	(1989) Sheet Steel Outlet Boxes, Device Boxes, Covers and Box Supports
NEMA OS 2	(1986; Errata Aug 15, 1986) Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports
NEMA PB 1	(1990; PB 1.1-1986) Panelboards
NEMA RN 1	(1989) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA ST 20	(1986) Dry-Type Transformers for General Applications
NEMA TC 2	(1990) Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
NEMA TC 13	(1986) Electrical Nonmetallic Tubing (ENT)
NEMA WD 1	(1983; R 1989) General Requirements for Wiring Devices
NEMA WD 6	(1988) Wiring Devices - Dimensional Requirements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1996) National Electrical Code
NFPA 101	(1988) Safety to Life from Fire in Buildings and Structures

UNDERWRITERS LABORATORIES (UL)

UL-03	(1990; Supple) Electrical Construction Materials Directory
UL 1	(Aug 28, 1985; 8th Ed) Flexible Metal Conduit
UL 5	(May 28, 1985; 10th Ed) Surface Metal Raceways and Fittings
UL 6	(Oct 23, 1981; 9th Ed; Rev thru Nov 22, 1989) Rigid Metal Conduit
UL 20	(Jun 12, 1986; 10th Ed; Rev thru Feb 20, 1991) General-Use Snap Switches
UL 50	(Sep 8, 1988; 9th Ed; Rev thru Mar 28, 1991) Cabinets and Boxes
UL 67	(Oct 12, 1988, 10th Ed; Rev thru Jun 27, 1990; Errata Aug 21, 1990) Panelboards
UL 83	(Sep 26, 1983; 9th Ed; Rev thru Dec 11, 1990) Thermoplastic-Insulated Wires and Cables
UL 98	(Jan 13, 1987; 11th Ed; Rev thru Apr 20, 1990) Enclosed and Dead-Front Switches

UL 360	(Aug 18, 1986; 3rd Ed; Rev Feb 20, 1990) Liquid-Tight Flexible Steel Conduit
UL 467	(Nov 22, 1984; 6th Ed; Rev thru Nov 14, 1986) Grounding and Bonding Equipment
UL 486A	(Nov 24, 1980; 7th Ed; Rev thru Oct 12, 1989) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 486B	(Apr 13, 1982; 2nd Ed; Rev thru Oct 12, 1989; Errata April 3, 1990) Wire Connectors for Use with Aluminum Conductors
UL 486C	(Dec 30, 1983; 1st Ed; Rev thru Oct 12, 1989) Splicing Wire Connectors
UL 489	(Sep 15, 1986; 7th Ed; Rev thru Oct 4, 1990) Molded-Case Circuit Breakers and Circuit-Breaker Enclosures
UL 498	(Apr 15, 1991; 12th Ed) Attachment Plugs and Receptacles
UL 506	(Dec 22, 1989; 10th Ed) Specialty Transformers
UL 508	(Sep 26, 1989; 15th Ed; Rev thru Mar 26, 1991) Industrial Control Equipment
UL 510	(Oct 6, 1986; 6th Ed; Rev Oct 7, 1986) Insulating Tape
UL 512	(Feb 16, 1987; 9th Ed) Fuseholders
UL 514A	(Dec 1, 1983; 7th Ed; Rev thru Jul 18, 1990) Metallic Outlet Boxes
UL 514B	(Mar 15, 1989; 2nd Ed; Rev thru Aug 9, 1990) Fittings for Conduit and Outlet Boxes
UL 514C	(Oct 31, 1988; 2nd Ed; Rev Jun 13, 1989) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 651	(Aug 3, 1989; 5th Ed; Rev thru Dec 4, 1989) Schedule 40 and 80 Rigid PVC Conduit
UL 651A	(Aug 10, 1989; 2nd Ed; Rev Aug 11, 1989) Type EB and A Rigid PVC Conduit and HDPE Conduit
UL 698	(Apr 23, 1991; 11th Ed) Industrial Control Equipment for Use in Hazardous (Classified) Locations
UL 797	(Oct 10, 1983; 5th Ed) Electrical Metallic Tubing
UL 817	(Dec 22, 1986; 9th Ed; Rev thru Jan 23, 1989) Cord Sets and Power-Supply Cords
UL 869A	(Mar 23, 1987; 1st Ed; Rev thru Nov 23, 1990) Service Equipment
UL 877	(Aug 15, 1985; 3rd Ed; Rev thru Mar 23, 1987) Circuit

	Breakers and Circuit-Breaker Enclosures for Use in Hazardous (Classified) Locations
UL 886	(Jun 12, 1985; 9th Ed; Rev thru Apr 14, 1991) Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations
UL 943	(Sep 11, 1985; 2nd Ed) Ground-Fault Circuit Interrupters
UL 1010	(Feb 26, 1991; 5th Ed; Rev May 15, 1991) Receptical-Plug Combinations for Use in Hazardous (Classified) Locations
UL 1029	(Dec 1, 1986; 4th Ed; Rev thru May 21, 1990) High-Intensity-Discharge Lamp Ballasts
UL 1242	(Oct 10, 1983; 1st Ed; Rev Nov 23, 1989) Intermediate Metal Conduit
UL 1571	(Feb 7, 1984; 2nd Ed; Rev thru Mar 19, 1991) Incandescent Lighting Fixtures
UL 1572	(Dec 10, 1984; 2nd Ed; Rev thru Mar 19, 1991; Errata Aug 22, 1990) High Intensity Discharge Lighting Fixtures
UL 1660	(Sep 17, 1987; 1st Ed) Liquid-Tight Flexible Nonmetallic Conduit

1.3 GENERAL

1.3.1 Rules

The installation shall conform to the requirements of NFPA 70 and NFPA 101, and Massachusetts State Code unless more stringent requirements are indicated herein or shown.

1.3.2 Coordination

The drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall become familiar with all details of the work and verify all dimensions in the field so that the outlets and equipment shall be properly located and readily accessible. Lighting fixtures, outlets, and other equipment and materials shall be located to avoid interference with mechanical or structural features; otherwise, lighting fixtures shall be symmetrically located according to the room arrangement when uniform illumination is required, or asymmetrically located to suit conditions fixed by design and shown. Raceways, junction and outlet boxes, and lighting fixtures shall not be supported from sheet metal roof decks. If any conflicts occur necessitating departures from the drawings, details of and reasons for departures shall be submitted and approved prior to implementing any change. The Electrical Contractor shall coordinate the electrical work with HVAC and electrical drawings and provide all power related wiring even if they are not shown on electrical drawings.

1.3.3 Hazardous Locations

Wiring in locations indicated shall conform to the NFPA 70 for Class I, Division 1 or Division 2 hazardous locations. Equipment shall be suitable for Group D. Wiring and equipment in locations indicated shall be of the classes, groups, divisions, and suitable for the operating temperature; all as indicated.

1.3.4 Standard Products

Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.3.5 Identification Nameplates

Major items of electrical equipment and major components shall be permanently marked with an identification name to identify the equipment by type or function and specific unit number as indicated. Designation of motors shall coincide with their designation in the motor control center or panel. Unless otherwise specified, all identification nameplates shall be made of laminated plastic in accordance with FS L-P-387 with black outer layers and a white core. Edges shall be chamfered. Plates shall be fastened with black-finished round-head drive screws, except motors, or approved nonadhesive metal fasteners. When the nameplate is to be installed on an irregular-shaped object, the Contractor shall devise an approved support suitable for the application and ensure the proper installation of the supports and nameplates. In all instances, the nameplate shall be installed in a conspicuous location. At the option of the Contractor, the equipment manufacturer's standard embossed nameplate material with black paint-filled letters may be furnished in lieu of laminated plastic. The following equipment, as a minimum, shall be provided with identification nameplates:

Minimum 1/4-Inch High Letters	Minimum 1/8-Inch High Letters
Panelboards	Control Power Transformers
Starters	Control Devices
Safety Switches	Instrument Transformers
Motor Control Centers	
Transformers	
Equipment Enclosures	
Switchgear	
Switchboards	
Motors	

Each panel, section, or unit in motor control centers, switchgear or similar assemblies shall be provided with a nameplate in addition to nameplates listed above, which shall be provided for individual compartments in the respective assembly, including nameplates which identify "future," "spare," and "dedicated" or "equipped spaces."

1.3.6 As Built Drawings

Following the project completion or turnover, within 30 days the Contractor shall furnish 2 sets of as built drawings to the Contracting Officer.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL

DESCRIPTIONS:

Electrical Work; GA

Detail drawings for all materials and equipment specified. Detail drawings shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical data; catalog cuts; and any special installation instructions that may be required. Drawings shall show applicable schematic diagrams; and equipment layout and anchorage ; and conduit and cable tray runs, anchorage, and support.

SD-09 Reports

Materials and Equipment; GA

The label or listing of the Underwriters Laboratories, Inc., shall be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing, a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements will be accepted. However, materials and equipment installed in hazardous locations must bear the UL label unless the data submitted from other testing agency is specifically approved in writing by the Contracting Officer. Materials and equipment shall be approved based on the manufacturer's published data.

For other than equipment and materials specified to conform to UL publications, a manufacturer's statement indicating complete compliance with the applicable Federal Specification, or standard of the American Society for Testing and Materials, National Electrical Manufacturers Association, or other commercial standard, is acceptable.

1.5 WORKMANSHIP

Materials and equipment shall be installed in accordance with recommendations of the manufacturer and as shown.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall conform to the respective publications and other requirements specified below. Materials and equipment not listed below shall be as specified elsewhere in this section.

2.1.1 Cables and Wires

Conductors in cables shall be annealed copper, except that AA-8000 series aluminum conductors may be used as an equivalent for copper conductors of No. 6 AWG or larger. Intermixing of copper and aluminum conductors in these sizes is not permitted. Design is based on copper conductors and aluminum conductors shall have an ampacity not less than that of the indicated copper conductors. Cables shall be single-conductor type, unless otherwise indicated. Cables and wires shall conform to UL 83 for the thermoplastic-insulated type.

2.1.1.1 Service Entrance Cable

Service cables shall be as indicated on the drawings.

2.1.1.2 Grounding Cables

Grounding cables shall be bare or shall have green low-voltage insulation.

2.1.1.3 Cord Sets and Power-Supply Cords

UL 817.

2.1.1.4 Ignition Cable

Electrical high tension unshielded ignition cable per MIL-C-3702, designation U7MC or U5MC, 16 AWG Stranded copper wire conductor, maximum O.D. is 7mm, insulation must withstand 30KV RMS, 60 HZ potential and 450 degree fahrenheit temperature. See Dwg E-4 for additional information.

2.1.2 Circuit Breakers

Circuit breakers shall have voltage, current and interrupting ratings as indicated. Fully rated circuit breakers shall be provided to obtain the specified interrupting rating.

2.1.2.1 Molded-Case and Insulated-Case Circuit Breakers

NEMA AB 1 and UL 489 for circuit breakers, and UL 877 for circuit breakers and circuit breaker enclosures in hazardous (classified) locations.

a. Molded-Case Circuit Breakers: Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multiple breakers shall be of the common-trip type having a single operating handle, but for sizes of 100 amperes or less may consist of single-pole breakers permanently factory assembled into a multiple unit having an internal, mechanical, nontamperable common-trip mechanism and external handle ties. Breakers shall have interchangeable, adjustable magnetic, trips in 225 amperes frame and larger. Breakers coordinated with current-limiting fuses shall have a combined interrupting capacity of 100,000 symmetrical amperes. All poles of associated breakers shall open if any fuse blows.

2.1.3 Conduit and Tubing

2.1.3.1 Electrical Nonmetallic Tubing (ENT)

NEMA TC 13.

2.1.3.2 Electrical Plastic Tubing and Conduit

NEMA TC 2

2.1.3.3 Flexible Conduit, Steel and Plastic

General-purpose type, UL 1; liquid tight, UL 360, and UL 1660

2.1.3.4 PVC Coated Rigid Steel Conduit

NEMA RN 1.

2.1.3.5 Rigid Aluminum Conduit

ANSI C 80.5 and UL 6

2.1.3.6 Rigid Metal Conduit

UL 6.

2.1.3.7 Rigid Plastic

NEMA TC 2, UL 651 and UL 651A.

2.1.3.8 Surface Metal Electrical Raceways and Fittings

UL 5.

2.1.4 Conduit and Device Boxes and Fittings

2.1.4.1 Boxes, Metallic Outlet

NEMA OS 1 and UL 514A.

2.1.4.2 Boxes, Nonmetallic, Outlet and Flush-Device Boxes and Covers

NEMA OS 2 and UL 514C.

2.1.4.3 Boxes, Outlet for Use in Hazardous (Classified) Locations

UL 886.

2.1.4.4 Boxes, Switch (Enclosed), Surface-Mounted

UL 98.

2.1.4.5 Fittings for Conduit and Outlet Boxes

UL 514B.

2.1.4.6 Fittings for Use in Hazardous (Classified) Locations

UL 886.

2.1.4.7 Fittings, PVC, for Use with Rigid PVC Conduit and Tubing

UL 514B.

2.1.5 Conduit Coatings Plastic Resin System

FS L-C-530 or NEMA RN 1, Type A-40.

2.1.6 Connectors, Wire Pressure

2.1.6.1 Copper Conductors

UL 486A.

2.1.6.2 Aluminum Conductors

UL 486B.

2.1.7 Electrical Grounding and Bonding Equipment

UL 467.

2.1.7.1 Ground Rods

Ground rods shall be of copper-clad steel conforming to UL 467 not less than 5/8 inch diameter by 10 feet in length of the sectional type driven full length into the earth.

2.1.7.2 Ground Bus

The ground bus shall be bare conductor or flat copper in one piece, if practicable.

2.1.8 Enclosures

NEMA ICS 6 or NEMA 250 or UL 698 for use in hazardous (classified) locations, unless otherwise specified.

2.1.8.1 Cabinets and Boxes

UL 50.

2.1.8.2 Circuit Breaker

UL 489.

2.1.9 Fixtures, Lighting and Fixture Accessories/Components

Fixtures, accessories and components, including ballasts, lampholders, lamps, starters and starter holders, shall conform to industry standards specified below.

2.1.9.1 Incandescent Fixture

NEMA LE 4 for ceiling compatibility of processed fixtures and UL 1571.

2.1.9.2 High-Intensity-Discharge

a. Ballasts: ANSI C82.4 for multiple supply types and UL 1029.

2.1.10 Fuses and Fuse Holders

2.1.10.1 Fuses, low voltage cartridge type

NEMA FU 1

2.1.10.2 Fuse Holders

UL 512

2.1.11 Instruments, Electrical Indicating

ANSI C39.1

2.1.12 Motors, AC, Fractional and Integral Kilowatt (Horsepower)

Motors, AC, fractional and integral, horsepower, 500 hp and smaller shall conform to NEMA MG 1 and UL 1004 for motors; and UL 674 for use of motors in hazardous (classified) locations.

2.1.12.1 Horsepower Rating

The horsepower rating of motors should be limited to no more than 125 percent of the maximum load being served unless a NEMA standard size does not fall within this range. In this case, the next larger NEMA standard motor size should be used.

2.1.12.2 Motor Efficiencies

All permanently wired polyphase motors of 746 W (1 hp) or more shall meet the minimum full-load efficiencies as indicated in the following table, and as specified in this specification. Motors not indicated or specified elsewhere to be standard or high efficiency type should be determined on the basis of expected operating hours.

Minimum Motor Efficiencies

W	HP	Std. Efficiency	High Efficiency
746	1	77.0	85.5
1119	1.5	78.5	85.5
1492	2	78.5	85.5
2238	3	78.5	88.5
3730	5	82.5	88.5
5595	7.5	84.0	90.0
7460	10	85.5	90.0
10190	15	85.5	91.0

2.1.13 Motor Controls

NEMA ICS 1, NEMA ICS 2, NEMA ICS 3 and NEMA ICS 6, and UL 508.

2.1.14 Panelboards

Dead-front construction, NEMA PB 1 and UL 67.

2.1.15 Receptacles

2.1.15.1 Standard Grade

UL 498

15.1.15.2 Ground Fault Interrupters

UL 943, Class A or B

2.1.15.3 Hazardous (Classified) Locations

UL 1010

2.1.16 Service Equipment

UL 869A.

2.1.17 Splice, Conductor

UL 486C.

2.1.18 Snap Switches

UL 20

2.1.19 Tapes

2.1.19.1 Plastic Tape

UL 510.

2.1.19.2 Rubber Tape

UL 510.

2.1.20 Transformers

2.1.20.1 Conventional Dry-Type

a. Specialty or general applications: NEMA ST 20 and UL 506 unless otherwise shown or specified.

2.1.21 Wiring Devices

NEMA WD 1 for general-purpose wiring devices, and NEMA WD 6 for dimensional requirements of wiring devices.

PART 3 - EXECUTION

3.1 GROUNDING

Grounding shall be in conformance with NFPA 70, the contract drawings, and the following specifications.

3.1.1 Ground Rods

The resistance to ground shall be measured using the fall-of-potential method described in IEEE Std 81. The maximum resistance of a driven ground shall not exceed 25 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, 3 additional rods not less than 6 feet on centers, or if sectional type rods are used, 2 additional sections may be coupled and driven with the first rod. In high-ground-resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately. Connections below grade shall be fusion welded. Connections above grade shall be fusion welded or shall use UL 467 approved connectors.

3.1.2 Grounding Conductors

A green ground wire shall be furnished regardless of the type of conduit. All equipment grounding conductors, including metallic raceway systems used as such, shall be bonded or joined together in each wiring box or equipment enclosure. Insure that all metallic raceways and grounding conductors are actually wired or bonded into a common junction. Metallic boxes and enclosures, if used, shall also be bonded to these grounding conductors by an approved means per NFPA 70. When boxes for receptacles, switches, or other utilization devices are installed, any designated grounding terminal on these devices shall also be bonded to the equipment grounding conductor junction with a short jumper.

3.2 WIRING METHODS

3.2.1 General Requirements

Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid aluminum or rigid zinc-coated steel conduit, rigid plastic conduit, or intermediate metal conduit.

3.2.2 Conduit and Tubing Systems

Conduit and tubing systems shall be installed as indicated. Conduit sizes shown are based on use of copper conductors with insulation types as described in paragraph WIRING METHODS. Minimum size of raceways shall be 1/2 inch. Only metal conduits will be permitted when conduits are required for shielding or other special purposes indicated, or when required by conformance to NFPA 70. Nonmetallic conduit and tubing may be used in damp, wet or corrosive locations when permitted by NFPA 70 and the conduit or tubing system is provided with appropriate boxes, covers, clamps, screws or other appropriate type of fittings. Bushings, manufactured fittings or boxes providing equivalent means of protection shall be installed on the ends of all conduits and shall be of the insulating type, where required by NFPA 70. Aluminum conduit may be used only where installed exposed in dry locations. Nonaluminum sleeves shall be used where aluminum conduit passes through concrete floors and firewalls.

3.2.2.1 PVC Coated Rigid Steel Conduit

All PVC coated rigid steel conduit and fittings shall be manufactured in accordance with NEMA RN1 1989. Both the interior and the exterior of conduit and fittings shall have a factory applied PVC coating. The interior of the conduit shall be further protected by a nominal 2 mil urethane coating applied over the PVC.

3.2.2.2 Below Slab-on-Grade or in the Ground

All electrical wiring below slab-on-grade shall be protected by a conduit system. Conduit passing vertically through slabs-on-grade shall be rigid steel. Rigid steel conduits installed below slab-on-grade or in the earth shall be PVC coated.

3.2.2.3 Installing in Slabs Including Slabs on Grade

Conduits shall be installed as close to the middle of concrete slabs as practicable without disturbing the reinforcement. Outside diameter shall not exceed 1/3 of the slab thickness and conduits shall be spaced not closer than 3 diameters on centers except at cabinet locations where the slab thickness shall be increased as approved by the Contracting Officer.

3.2.2.4 Changes in Direction of Runs

Changes in direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Care shall be taken to prevent the lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment during the course of construction. Clogged raceways shall be entirely freed of obstructions or shall be replaced.

3.2.2.5 Supports

Metallic conduits and tubing shall be securely and rigidly fastened in place at intervals of not more than 10 feet and within 3 feet of boxes, cabinets, and fittings, with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, or ceiling trapeze. C-clamps or beam clamps shall have strap or rod-type retainers. Rigid plastic conduits (if permitted as a wiring method) shall be supported as indicated above, except that they will be supported at intervals as indicated in NFPA 70. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structures, but no load shall be applied to joist bridging. Fastenings shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine screws. Raceways or pipe straps shall not be welded to steel structures. Holes cut to a depth of more than 1-1/2 inches in reinforced concrete beams or to a depth of more than 3/4-inch in concrete joists shall avoid cutting the main reinforcing bars. Holes not used shall be filled. In partitions of light steel construction, sheet-metal screws may be used. Conduit shall not be supported using wire or nylon ties. Raceways shall be installed as a complete system and be independently supported from the structure. Upper raceways shall not be the support of lower raceways. Supporting means will not be shared between electrical raceways and mechanical piping or ducts and shall not be fastened to hung ceiling supports. Conduits shall be fastened to all sheet-metal boxes and cabinets with two locknuts where required by the NFPA 70, where insulating bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. Threadless fittings for electrical metallic tubing shall be of a type approved for the conditions encountered. A pull wire shall be inserted in each empty raceway in which wiring is to be installed by others if the raceway is more than 50 feet in length and contains more than the equivalent of two 90-degree bends, or where the raceway is more than 150 feet in length. The pull wire shall be of No. 14 AWG zinc-coated steel, or of plastic having not less than 200-pound tensile strength. Not less than 10 inches of slack shall be left at each end of the pull wire. Additional support for horizontal runs is not required when EMT rests on steel stud cutouts.

3.2.3 Cables and Conductors

Aluminum conductors shall have ampacity of not less than the copper conductors. Wire connectors of insulating material or solderless pressure connectors properly taped shall be utilized for all splices. Pressure connectors for aluminum conductors shall have tinned aluminum bodies. Aluminum contact surfaces of conductors and connectors shall be cleaned and covered with antioxidant compound prior to making of connections.

3.2.3.1 Sizes

All sizes are based on copper conductors, unless otherwise indicated. Sizes shall be not less than indicated. Branch-circuit conductors shall be not smaller than No. 12 AWG. Class 1 remote control and signal circuit conductors shall be not less than No. 14 AWG. Class 2 remote control and signal circuit conductors shall be not less than No. 16 AWG. The conductor sizes are based on the use of THHN/THWN insulation for conductors smaller than No. 1/0 AWG and THW or THHN/THWN insulation for conductors No. 1/0 and larger, except where otherwise indicated. Higher temperature rated conductors shall be permitted to be used, if the UL tested temperature ratings for which the equipment in the circuit is marked are not exceeded.

3.2.3.2 Power Conductor Identification

All phase conductors shall be identified by color-coding. The color of the insulation on the phase conductors of different voltage systems shall be as follows:

120/208 volt, single/phase: Black and red.

Conductor phase and voltage identification shall be made by color-coded insulation for all conductors smaller than No. 6 AWG. For conductors No. 6 AWG and larger, identification shall be made by color-coded insulation, or conductors with black insulation may be furnished and identified by the use of half-lapped bands of colored electrical tape wrapped around the insulation for a minimum of 3 inches of length near the end, or other method as submitted by the Contractor and approved by the Contracting Officer. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Phase identification by a particular color shall be maintained continuously for the length of a circuit, including junctions.

3.2.3.3 Control Conductor Identification

Control circuit conductor identification shall be made by color-coded insulated conductors, plastic-coated self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means as approved. Control circuit terminals of equipment shall be properly identified. Terminal and conductor identification shall match that shown on approved detail drawings. Hand lettering or marking is not acceptable.

3.3 BOXES AND SUPPORTS

Boxes shall be provided in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways, 4-inch by 4-inch nominal size and smaller, shall be of the cast-metal hub type when located in normally wet locations, when flush and surface mounted on outside of exterior surfaces, or when located in hazardous areas. Large size boxes shall be NEMA 3R or as shown. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and metal expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel work. Threaded studs driven in by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of expansion shields, or machine screws.

3.3.1 Pull Boxes

Pull boxes of not less than the minimum size required by the NFPA 70 shall be constructed of aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified above. Boxes shall be furnished with screw-fastened covers. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number, and panel designation.

3.3.2 Conduit Stub-Ups

Conduits stubbed up through concrete floors for connections to freestanding equipment shall be provided with a short elbow and an adjustable top or coupling threaded inside for plugs, set flush with the finished floor. Wiring

shall be extended in rigid threaded conduit to equipment, except that where required, flexible conduit may be used 6 inches above the floor. Screwdriver-operated threaded flush plugs shall be installed in conduits from which no equipment connections are made to suit the devices installed.

3.4 DEVICE PLATES

One-piece type device plates shall be provided for all outlets and fittings. Plates on unfinished walls and on fittings shall be of zinc-coated sheet steel, cast-metal, or impact resistant plastic having rounded or beveled edges.

3.5 RECEPTACLES

3.5.1 Duplex

Duplex receptacles shall be rated 20 amperes, 125 volts, two-pole, three-wire, grounding type with polarized parallel slots. Bodies shall be of brown and supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side- or back-wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke. Receptacles with ground fault circuit interrupters shall have the current rating as indicated, and shall be UL Class A type unless otherwise shown. Ground fault circuit protection shall be provided as required by NFPA 70 and as indicated on the drawings.

3.5.2 Weatherproof

Weatherproof receptacles shown shall be mounted in a box with a gasketed, weatherproof, cast-metal cover plate and gasketed cap over each receptacle opening. The cap shall be provided with a spring-hinged flap.

3.6 WALL SWITCHES

Wall switches shall be of the totally enclosed tumbler type. The wall switch handle shall be brown. Wiring terminals shall be of the screw type or of the solderless pressure type having suitable conductor-release arrangement. Not more than one switch shall be installed in a single-gang position. Switches shall be rated 20-ampere, 120 volt, for use on alternating current only.

3.7 SERVICE EQUIPMENT

Service-disconnecting means shall be of the enclosed molded-case circuit breaker type as indicated with external handle for manual operation. When service disconnecting means is a part of an assembly, the assembly shall be listed as suitable for service entrance equipment. Enclosures shall be sheet metal with hinged cover for surface mounting unless otherwise indicated.

3.8 PANELBOARDS

Circuit breakers and switches used as a motor disconnecting means, and not in sight of the motor and the driven machinery location, shall be capable of being locked in the open position. Door locks shall be keyed alike. Nameplates shall be as approved. Directories shall be typed to indicate loads served by each circuit and mounted in a holder behind a clear protective covering. Busses shall be copper or aluminum.

3.8.1 Panelboards

Panelboards shall be circuit breaker equipped.

3.9 UNDERGROUND-SERVICE CONDUITS

Conduits for underground electric-service cable shall be installed as indicated.

3.10 MOTORS

Motors shall be as specified in Paragraph MATERIALS AND EQUIPMENT for Motors, AC, Fractional and Integral Watt (373,000 W and smaller) Horsepower (500 Hp and Smaller), whether or not motors are separately provided or included in equipment assemblies specified in other sections of these specifications. Each motor shall conform to the W (HP) and voltage ratings indicated, and shall have a service-factor and other characteristics that are essential to the proper application and performance of the motors under conditions shown or specified. The Contractor shall be responsible for selecting the actual horsepower ratings and other motor requirements necessary for the applications indicated. When electrically driven equipment furnished under other sections of these specifications materially differs from the design, the Contractor shall make the necessary adjustments to the wiring, disconnect devices and branch-circuit protection to accommodate the equipment actually installed.

3.11 MOTOR CONTROL

Each motor or group of motors requiring a single control shall be provided under other sections of these specifications with a suitable controller and devices that will perform the functions as specified for the respective motors. Each motor of 93 W (1/8-hp) or larger shall be provided with thermal-overload protection. The overload-protection device shall be provided either integral with the motor or controller, or shall be mounted in a separate enclosure. Unless otherwise specified, the protective device shall be of the manually reset type. Single- or double-pole tumbler switches specifically designed for alternating-current operation only may be used as manual controllers for single-phase motors having a current rating not in excess of 80 percent of the switch rating. All controls shall be 120 volts or less unless otherwise indicated.

3.11.1 Contacts

Contacts in miscellaneous control devices such as float switches, pressure switches, and auxiliary relays shall have current and voltage ratings in accordance with NEMA ICS 2 for rating designation B300.

3.12 MOTOR-DISCONNECT MEANS

Each motor shall be provided with a disconnecting means when required by NFPA 70 even though not indicated. For single-phase motors, a single- or double-pole toggle switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125 percent of the motor rating. Switches shall disconnect all ungrounded conductors.

3.13 LAMPS AND LIGHTING FIXTURES

Ballasted fixtures shall have ballasts which are compatible with the specific type and rating of lamps indicated and shall comply with the applicable provisions of the publications referenced.

3.13.1 Lamps

Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.

3.13.1.1 Incandescent

Incandescent lamps shall be for 120 volt operation unless otherwise indicated.

3.13.1.2 High-Intensity-Discharge

High-intensity-discharge lamps shall be the high-pressure-sodium type unless otherwise indicated, shown or approved.

3.13.2 Fixtures

Fixtures shall be as shown and shall conform to the following specifications and shall be as detailed on the drawings. Illustrations shown are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar designs and equivalent energy efficiency, light-distribution and brightness characteristics, and of equal finish and quality will be acceptable if approved.

4.13.2.2 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation.

3.14 EQUIPMENT CONNECTIONS

All wiring not furnished and installed under other sections of the specifications for the connection of electrical equipment as indicated on the drawings shall be furnished and installed under this section of the specifications. Connections shall comply with the applicable requirements of paragraph WIRING METHODS. Flexible conduits 6 feet or less in length shall be provided to all electrical equipment subject to periodic removal, vibration, or movement and for all motors. All motors shall be provided with separate grounding conductors. Liquid-tight conduits shall be used in damp or wet locations.

3.14.1 Motors and Motor Control

Control equipment furnished under this section of the specifications, and shown on the drawings, shall be connected under this section of the specifications unless shown or specified otherwise. Except as otherwise specifically noted, automatic-control wiring, signaling, and protective devices are not included in this section of the specifications, but shall be furnished and installed under other sections of the specifications. Control wiring not shown on the drawings shall be furnished under the other sections of the specifications.

3.15 PAINTING AND FINISHING

Field-applied paint on exposed surfaces shall be provided under Section 09900 PAINTING, GENERAL.

3.16 TESTS

After the interior-wiring-system installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct an

operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. Continuity test shall be conducted on the telephone wiring system. The test shall be performed in the presence of the Contracting Officer. The Contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power. No part of the electrical distribution system shall be energized prior to the resistance testing of that systems ground rods and submission of test results to the Contracting Officer. Test reports shall indicate the location of the rod and the resistance and the soil conditions at the time the test was performed.

3.17 ONE-LINE DIAGRAM

Provide a one-line diagram indicating the existing main transformer, building disconnect means, and feeder breakers/switches to building panels located at the building disconnect. Diagram shall be mounted under glass or shall be plastic laminated. The breaker/switch identification on the diagram shall match nameplate on the installed equipment.

END OF SECTION 16415

SECTION 16642 CATHODIC PROTECTION SYSTEM(IMPRESSED CURRENT AND SACRIFICIAL ANODES)

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE, INC., (ANSI) STANDARD

ANSI C80.1-	(1990) Rigid Steel Conduit - Zinc-coated

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 418	(1988) Cast and Wrought Galvanized Zinc Anodes
ASTM A 53	(1990) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM D 1248	(1984; R 1989) Polyethylene Plastics Molding and Extrusion Materials

FEDERAL SPECIFICATIONS (FS)

J-C-30A & AM-1	Cable and Wire, Electrical (Power, Fixed Installation)
HH-I-595	(Rev C)Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

MILITARY SPECIFICATIONS (MS)

MS MIL-I-1361	(Rev C; Notice 1) Instrument Auxiliaries, Electrical Measuring: Shunts, Resistors, and Transformers

NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)

NACE RP0169	(Rev 1992) Recommended Practice. Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE RP0188	Standard Recommended Practice Discontinuity (Holiday) Testing of Protective Coatings
NACE RP0285	Recommended Practice. Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Metallic Liquid Storage Systems
NACE RP0286	Recommended Practice. The Electrical Isolation of Cathodically Protected Pipelines.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA TC 2	(1990) Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 and EPC-80)
NEMA WC 5	(1992) Thermoplastic-Insulated Wire and Cable

	for the Transmission and Distribution of Electrical Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1996) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 6	(1993) Rigid Metal Conduit
UL 467	(1993) Grounding and Bonding Equipment
UL 506	1989; Rev Jan 1993 Specialty Transformers
UL 510	1986; Rev Oct 1986 Insulating Tape
UL 514A	1991; Metallic Outlet Boxes

1.2 GENERAL REQUIREMENTS AND SYSTEM DESCRIPTION

1.2.1 Scope of Services

The Contractor shall furnish and install a complete operating impressed current cathodic protection system augmented when necessary by a sacrificial anode system in the areas shown that will be in complete accordance with NFPA 70, (with Form 49 CFR Part 192, Subpart E) of the Federal Regulations, and Massachusetts State Code and with all applicable federal, state and local regulations and comply with requirements of this contract.

1.2.2 Services

The services required include planning, inspecting the installation, adjusting and testing cathodic protection and test system using rectifiers and impressed current anodes supplemented with sacrificial anodes for cathodic protection of the gas pipe , water pipe , drain lines and conduit. The cathodic protection system shall include rectifiers, anodes, cables, connectors, splices, corrosion protection test stations, AC power panels, and any other equipment required for a complete operating system providing the criteria of protection as specified. Insulators are required whenever needed to insulate the piping and conduit from any other structure. The scope of services include, but are not limited to, the following:

(a) Close internal potential surveys (pipe reference cell data taken at close intervals).

(b) Cathodic protection systems design.

(c) System testing.

(d) Interference testing.

(e) Training.

(f) Operating and maintenance manual.

(g) Insulator testing and bonding testing.

(h) Holiday test of coating.

1.2.3 Services of Corrosion Engineer

The services of a corrosion engineer shall be provided to supervise, inspect and test the installation and performance of the cathodic protection system. Corrosion engineer refers to a person, who, by reason of his knowledge of the physical sciences and the principles of engineering and mathematics, acquired by professional education and related practical experience, is qualified to engage in the practice of corrosion control. Such person may be a licensed professional corrosion engineer or may be a person certified as being qualified by the National Association of Corrosion Engineers (NACE), if such licensing or certification includes 3 years experience in corrosion control on underground metallic surfaces of the type component or structure being protected. NACE certification shall be technologist, corrosion specialist, or cathodic protection specialist.

1.2.4 Coating

Coatings for metallic components shall be as required for metallic fittings in paragraph on Coating.

1.2.5 Cathodic Protection System

The cathodic protection systems shall include rectifiers, anodes, cables, connectors, splices, corrosion protection test stations, AC power panels, and any other equipment required for a complete operating system providing the NACE criteria of protection and as specified. Insulators are required whenever needed to insulate the pipes from any other structure (including existing pipes). Insulator shall be provided with lightning protection and a test station. The cathodic protection system shall also consist of (a) the engineer's verification of system planning and providing calculations for rectifier, anodes, and any recommendations for supplementing or changing the minimum design criteria as necessary to provide the specified potentials and (b) the Contractor's providing and installing all equipment, wiring, and wiring devices necessary to produce a continuous flow of direct current from anodes in the soil electrolyte to the pipe surfaces and placing the system in operable status. The Contractor's installation shall meet the criteria of protection outlined herein for a 20-year life. The purpose of the system is to adequately and efficiently protect the surfaces of the pipes against corrosion where the surfaces are in contact with soil; this is in addition to the protection provided by the protective coating on the pipes. The contract drawings indicate the extent and general arrangement of the pipes to be protected. The Contractor shall be completely responsible for satisfactory performance of the complete systems which he furnishes. The design of this system is based on an impressed current system supplemented with magnesium anodes. The Contractor may modify the cathodic protection system after review of the project, site verification and analysis if the proposed modification includes the impressed current anodes and rectifiers and will provide better overall system performance. This modification must be fully described and submitted by the Contractor and approved by the Contracting Officer. Modifications or additional anodes shall be at no additional cost to the Government. Any modification shall incorporate all requirements of this specification. The Contractor shall use this impressed current system as described with anodes in his calculations and submitted data to meet this specification. Anodes shall be installed in sufficient number and of the required type, size and spacing to obtain a uniform current distribution of 2.5 milliampere per square foot minimum to gas pipeline and conduit and underground metal surfaces. For each cathodic protection system, the metallic components and structures to be protected shall be made electrically continuous. This is to be accomplished by installing bond wires between the various structures. Bonding of existing buried structures may also be

required to preclude detrimental stray current effects. The electrical isolation of the underground facilities, when
not specified elsewhere, shall be included as a part of the work under this section of this specification and shall be accomplished in accordance with acceptable industry practice.

1.2.6 Verification of Site Conditions

The Contractor shall coordinate and properly relate this work to the site and to the work of all trades. The general locations of the pipe lines and structures to receive protection are shown on the drawings. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, shall verify existing conditions in the field, determine the exact locations of lines and structures to be protected, and advise the Contracting Officer of any discrepancy or hindrance to performing the specified work before performing any work. The Contractor shall take resistivity measurements of the soil in the vicinity of the pipes and ground bed sites, and provide this data with detailed system drawings for approval by the Contracting Officer.

1.2.7 System Parameters

The Contractor shall be responsible that the system furnished shall provide complete protection to underground pipes but shall not result in stray current damage to other structures and shall not create safety hazards.

1.2.8 System Capacity and Arrangement

The drawings indicate the minimum cathodic protection system considered capable of providing adequate protection to the piping. The Contractor shall, in his submittal, revise and supplement the system shown on the drawings as necessary to meet the following criteria. The system provided shall achieve a minimum pipe-to-soil "Instant Off" potential of minus 0.85 volts potentials with reference to a saturated copper-copper sulfate reference cell on all underground components of the piping. Based upon the measurements taken, the current and voltage of the rectifier should be adjusted as required to produce a minimum of minus 850 millivolts "Instant Off" potential between the structure being tested and the reference cell. This potential should be obtained over 90 percent of the metallic area. This must be achieved without the "Instant Off" potential exceeding 1200 millivolts. Acceptance criteria of the cathodic protection systems are defined in RP-01-69.

1.2.9 Stray Current Control

Provisions shall be included as part of the cathodic protection system construction to return all stray current caused by the cathodic protection system to its source in such a manner that no damage occurs to the structures intercepting the stray current. These provisions shall include joint bonding of cast iron or other sectional metallic pipe as necessary to make such structures continuous and interference bonding as necessary to return stray current from all underground metallic structures conducting such current to its source without damage to the conducting structure.

1.2.10 Provisions for Safety

Approved zinc grounding cells or sealed weatherproof lightning arrestor devices approved by the Contracting Officer shall be installed across all insulated flanges or fittings installed in underground piping as indicated on drawings. The arrestor shall be gapless, self-healing, solid state type. Zinc anode composition shall conform to ASTM B-418, Type II. Lead wires shall

be number 6 AWG copper with high molecular weight polyethylene (HMWPE) insulation. The zinc grounding cells shall not be prepackaged in backfill but shall be installed as detailed on drawings. Lightning arrestors or zinc grounding cells are not required for insulated flanges on metallic components used on nonmetallic piping systems.

1.2.11 Sacrificial Anodes

Sacrificial high potential magnesium anodes shall be located as required to provide localized cathodic protection or supplemental cathodic protection for the impressed current system. Each sacrificial magnesium anode shall be routed through a test station until the impressed current system has final power adjustment, the magnesium anode will not be connected to the pipe.

1.3 SUBMITTALS

Within 45 days after receipt of notice to proceed, and before commencement of any work, the following shall be submitted in accordance with Section 01300 SUBMITTALS: Detailed drawings of cathodic protection for each component shall be submitted to the Contracting Officer for approval within 45 days after date of receipt of notice to proceed, and before commencement of any work. Metallic pipe under buildings and underground shall not be installed before approval of the cathodic protection system.

Government approval is required for submittals with a “GA” designation; submittals having an “F1O” designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Materials and Equipment GA

A complete itemized listing of equipment and materials proposed for incorporation into the work shall be submitted. Each such itemization shall include an item number, the quantity of items proposed, and the name of the manufacturer of each such item.

Approval of Materials and Equipment: Within 45 days after date of receipt of notice to proceed, and before commencement of installation of any materials or equipment, the Contractor shall submit for approval a complete list of materials and equipment to be incorporated in the work. All submittals shall be made in English. The list shall include cuts, diagrams, results of system design calculations to include soil resistivity, and such other descriptive data as may be required by the Contracting Officer for the following list of material. Partial lists submitted from time-to-time will not be considered. After completion of the project, if supplemental magnesium anodes are added by the Contractor, a report shall be submitted showing additional anodes, their design and effect on system, locations and results. Additional anodes shall be installed only after approval from the Contracting Officer's representative. A final report shall be submitted to the Contracting Officer for approval with regard to any anode installation. This information shall include: (a) pipe-to-soil measurements throughout the affected area, indicating that the additions have corrected the conditions which made the additions necessary; and (b) anode current measurements for anodes shall be submitted. The following is a listing of special materials and information required in the submittal:

Rectifiers (show calculations on current and voltage for 100 V rectifier), rectifier and meters specifications. Include number and size of rectifiers, meter accuracy, etc.

Taping materials.

Conductors.

Zinc grounding cell installation procedures and equipment.

Anodes (impressed current and magnesium).

Coating material and holiday testing procedures. (This submittal is required prior to installation of any pipe.)

Test procedure (showing sequence of testing in itemized format). This submittal is required prior to installation of any pipe. This test procedure will include factory testing of anode connections to conductors. A drawing will be provided showing the location of each conductor connection with distances to confirm compliance with para. 2.1.1.4.

System design calculation (anode life, anode parameter, rectifier current and voltage). Determination of the number of anodes to achieve protective potential.

Backfill shield material and its installation details showing waterproofing.

Insulated resistance wire.

Bonding installation details and waterproofing details.

Layout of anodes, anode type, piping system test stations and isolation points, and grounding (includes impressed current and sacrificial). Drawing is required.

Special details.

Certified experience data of installing firm, and qualifications of corrosion engineer.

Procedure for rectifier testing and adjustment, and method of identification on rectifier components.

Exothermic weld equipment and material.

SD-04, Detail Drawings

Cathodic Protection System, GA

Detail drawings consisting of a complete list of equipment and material including manufacturer's descriptive and technical literature, catalog cuts, installation instructions and certified test data stating the maximum recommended anode current output density and the rate of gaseous production of any at that current density. The Contractor shall submit detailed drawings of all proposed work including any proposed changes.. Proposed changes in location, scope or performance must be approved by the Contracting Officer. These drawings shall indicate any variation from, additions to, or clarifications of drawings. The drawings shall show proposed changes in anode arrangement, anode size and number, anode materials, anode layout details, conduit size, wire size, mounting details, wiring diagram, method for

electrically isolating each pipe as required thereinafter, and any other pertinent information considered necessary for the proper installation and performance of the system. All shop drawings shall be submitted at one time as a single submittal in order to demonstrate that the items have been properly coordinated and will function properly as a unit. A notation shall be made on each shop drawing submitted as to the item's specified use, either by a particular type number referenced on the drawings or in the specifications, or by a reference to the applicable paragraph of the specification, or by a description of its specific location.

SD-08, Statements of Experience and Qualifications

Qualifications, F1O

Evidence of qualifications of the corrosion engineer.

Certification shall be submitted with the detail drawings, giving the name of the firm, the number of years of experience, and a list of not less than five (5) of this firm's installations three (3) or more years old that have been tested and found satisfactory.

Services of Corrosion Engineer: The Contractor shall obtain the services of a corrosion engineer to supervise, inspect and test the installation and performance of the cathodic protection system. Such person may be a licensed professional corrosion engineer or may be a person certified as being qualified by the National Association of Corrosion Engineers if such licensing or certification includes 3 years experience in corrosion control on underground surfaces of the type structure to be protected.

Name and Qualifications: The corrosion engineer's and/or supervisor's name and qualifications shall be certified in writing to the Contracting Officer prior to the start of construction.

Workmanship: Material and equipment shall be installed in accordance with the recommendations of the manufacturer as approved by the Contracting Officer, to conform to the contract documents. The installation, including final performance testing, shall be performed by an organization that has had not less than three (3) years experience in this type of work. The installation of this system shall be supervised by an individual who has satisfied the requirements for accreditation as a corrosion specialist or technologist by the National Association of Corrosion Engineers or by a professional engineer registered in corrosion engineering. The supervisor shall be on the site during construction and testing. The supervisor or his trained representative (who must be recognized by NACE as a corrosion technologist or specialist in training) is to make at least three (3) visits to the project site. The first of these visits shall include obtaining soil resistivity data, acknowledging the type of pipeline coatings to be used, and acclimating the other contractor discipline with the cathodic protection requirements. Once the submittals are approved and the materials delivered, the supervisor shall revisit the project. This visit shall include ensuring the contractor understands installation practices and laying out the components. The last visit shall involve testing the new cathodic protection systems and training applicable base personnel on proper maintenance techniques.

SD-09, Test Reports

Test and Measurements, F1O

Upon completion and testing of the installed system, test reports shall be submitted in booklet form tabulating all field tests and measurements

performed. Each test report shall indicate the final position of controls. Test results showing bonding, insulators and holiday coating test shall be submitted for approval within 45 days after notice to proceed.

Measurements: All pipe-to-soil potential measurements including initial potentials where required shall be recorded. The Contractor shall locate, correct and report to the Contracting Officer any short circuits to foreign pipes encountered during check-out of the installed cathodic protection system, in accordance with paragraph INTERFERENCE TESTING. Pipe-to-soil potential measurements are required on as many pipes as necessary to determine the extent of protection or to locate short circuits. All test data from each test shall be recorded in tabulated form and correlated to a field location designated and identified on a drawing. Test data from insulating fittings shall be identified such as continuous (bonded) or insulated location, location identified and correlated to field position. All performance data and each test will become part of the O&M Manual.

Submit six (6) copies of construction drawings.

Each test shall be witnessed by the Contracting Officer.

Provide test reports in booklet form tabulating all field tests, measurements and results after complete testing of the installed system. Each test report shall indicate the final position of controls. A certified test report showing that the connecting method has passed a 120-day laboratory test without failure at the place of connection, wherein the anode is subjected to maximum recommended current output while immersed in a 3-percent sodium chloride solution.

Testing method, procedure, equipment used, test results (in tabulated form correlated to an identified drawing location), action taken, (if corrective action, describe) and all pertinent facts relating to the test.

Tests requiring above submittals:

(1) Close interval potential survey

(2) Casing test

(3) Interference test

(4) Final system test verifying protection

(5) Insulated joint and bond test

(6) Holiday coating test

A procedure for adjustment of the cathodic protection using test stations and the rectifier. Final adjustments shall be submitted with potential test.

Method for insulating joint testing and detailed record for field testing and tabulated results.

Test Stations. All test stations showing details. This will include terminal connections in each test station.

Power unit wiring diagram.

Welding method for electrical connections.

Electrical isolation material, method and locations.

Motors and Motor Control

SD-13, Certificates

Cathodic Protection System, F1O
Where materials or equipment are specified to conform to the standards or publications, and requirements of ANSI, ASTM, FM, IES, NEMA, NFPA, or UL, or to conform to an FS, the Contractor shall submit proof that the items furnished under this section of the specifications conform to the specified requirements. The label or listing by the specified agency or organization or the manufacturer's certification or published catalog specification data statement that the items comply with applicable specifications, standards, or publications and with the manufacturer's standards will be acceptable evidence of such compliance.

Certificates shall be prepared by the manufacturers when the manufacturer's published data or drawings do not indicate conformance with other requirements of these specifications.

SD-19, Operation and Maintenance Manuals

Cathodic Protection System, F1O

Operations and Maintenance Manuals shall be submitted in accordance with the requirements of Specification SECTION: C-01800, EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS.

Before final acceptance of the cathodic protection system, six (6) sets of typewritten instructions covering the maintenance and operation of the installation shall be prepared and submitted to the Contracting Officer. The instructions shall cover proper adjustment of the current flow, a brief description of cathodic protection principles, a single-line operating diagram, and any other information concerned with the proper care and maintenance of the installation. The instructions shall be neatly bound between permanent covers and titled "Maintenance and Operating Instructions". The instructions shall be submitted for the Contracting Officer's approval. The instructions shall include the following:

(a) As-built drawings, to scale of the entire system, showing the locations of the piping, locations of all anodes and test stations, locations of all insulating joints, and structure-to-reference cell potentials as measured during the tests required by TESTS AND MEASUREMENTS, of this section.

(b) Recommendations for maintenance testing, including instructions in making pipe-to-reference cell potential measurements and frequency of testing. Testing and instructions shall also be provided for dielectric connections, interference bonds, and sacrificial anode bonds.

(c) All maintenance and operating instructions and nameplate data shall be in English.

(d) Instructions shall include precautions to insure safe conditions during repair of pipe system.

(e) Spare Parts Data

After approval of shop drawings, and not later than three months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts, special tools, and supplies, with current unit prices and source of supply. Spare parts data shall be included for the rectifier chosen for use in the project. In addition, the Contractor shall supply information for material and equipment replacement for all other components of the complete system, including anodes, cables, splice kits and connectors, corrosion test stations, coke breeze, and any other components not listed above.

PART 2 - PRODUCTS

2.1 IMPRESSED CURRENT ANODES

2.1.1 Mixed Metal Oxide Anodes

Mixed metal oxide anodes shall be of the size indicated and shall conform to the following requirements.

2.1.1.1 Conductive Material

The electrically conductive coating shall contain a mixture consisting primarily of iridium, tantalum, and titanium oxides. Although the exact composition of the conducting layer can vary, the average composition is generally a 50/50 atomic percent mixture of iridium and titanium oxides, with a small amount of tantalum. In addition, it is the manufacturer's responsibility to test the resistivity, no more than 0.002 ohm-centimeter, and the bond strength shall be greater than 50 MPa, and current capacity life, in order to guarantee the quality of the conductive ceramic coating. The adhesion or bond strength shall be determined by epoxy bonding a 7/64-inches diameter stud to the ceramic coating and measuring the load to failure of either the epoxy (about 70 MPa) or the interface between the coating and the substrate. The anode must be inert and the electrically conductive ceramic coating dimensionally stable. The ceramic coated anode shall be capable of sustaining a current density of 100 ampere/meter^2 in an oxygen generating electrolyte at 150 degF for 20 years, to ensure the current capacity life. An accelerated current capacity life test must be performed by the manufacturer on every lot of anode wire used to construct the anode as described. The mixed metal oxide coating shall be applied to the wire anode by a firm that is regularly engaged in and had a minimum 5 years experience in manufacturing and applying mixed metal oxide coatings to titanium anode substrates. The mixed metal oxide must be sintered to the titanium surface in such a way that it remains tightly bound to the surface when bent 180 degrees onto itself.

2.1.1.2 Anode Life Test

Accelerated Anode Life Test shall be conducted by the manufacturer. Test results shall be submitted for approval.

The anode wire material is to be suitable for sustaining current densities of 100 ampere/meter^2 in an oxygen generating electrolyte for 20 years. The manufacturer shall certify that a representative sample taken from the same lot used to construct the anode, has been tested and meets the following criteria. The test cell is able to sustain a current density of 10,000 ampere/meter^2 in a 15 weight percent sulfuric acid electrolyte at 150 degF without an increase in anode to cathode potential of more than 1 volt. The cell containing the anode shall be powered with a constant current power

supply for the 30 day test period. The representative sample shall be 5 inches in length and be taken from the lot of wire that is to be used for the anode.

2.1.1.3 Canister-Contained Mixed Metal Oxide Anodes

Canister-contained mixed metal oxide anodes shall be packed at the factory in light weight, light gage steel uni-body TIG welded canisters with calcinated petroleum coke breeze. The canisters shall be capped with TIG welded steel and caps providing a totally encapsulated construction. The connecting cable shall pass through a hole in an end cap designed to be tight fitting with a heavy duty strain relief allowing for handling of the canister by the cable. The anode shall be centered in the canister by centralizers to maintain rod position.

2.1.1.4 Mixed Metal Oxide Wire Anode

Anode wire attached to the feeder cable shall be grade 1 CP titanium, 1/8"in diameter and coated with a Mixed Metal Oxide Ceramic. Cable-to-anode contact resistance shall be 0.003 ohms maximum. Each wire anode must be capable of producing a minimum output of eight (8) amperes for twenty (20) years. Each MMO wire anode must be connected to the feeder cable at close intervals in order to assure the feeder cable attenuation and anode wire attenuation will not combine to be greater than 10% in terms of the available cathodic protection current at any point on the anode over the length of the anode assembly for the given application. The anode material is to be suitable for sustaining the specified current densities of 8 amperes devided over linear distances of 120 feet and 150 feet for 20 years in a sand electrolite at a temperature of 41-122 degrees F. The manufacturer must certify that a quality assurance program is maintained in which the manufacturing process and the relationship between the manufacturer’s accelerated testing performed on the product produced has been validated and deemed suitable for the application for which the anode material has been specified unless otherwise stated or agreed upon with the user. All connections shall be factory constructed under controlled conditions utilizing quality control procedures and shall be moisture free waterproof connections. It shall be sufficiently rugged so that normal handling during shipment and installation will pose no threat to the anode integrity.

2.1.1.5 Anode Connecting Cables

Anodes shall have connecting cables installed at the factory. The connection between the anode canister or anode wire and the lead wire shall be made with a solid crimp couple with solder. The connection is then to be sealed in cast epoxy. The feeder cable to which the wire anode is attached piggyback and the lead wire for distribution, including lead wire for the canister anodes shall be No. 8 AWG stranded copper wire with type CP high molecular weight polyethylene, 7/64-inch thick insulation, 600-volt rating, in accordance with NEMA WC 5. Each canister anode shall have a minimum of 250 feet of lead wire factory installed. The (MMO) wire anodes shall have redundant (2)lead wires each 250 feet long factory installed. Canister anode connecting cables shall consist of an ultra low resistance solder connection which is a minimum of three times stronger than the cable. For ceramic coated canister anodes, the cable connection shall consist of two molded dielectric layers (pressure seals), a flexible backfill resin encapsulant stabilizer, a schedule 40 PVC pipe polyvinyl chloride Type 1 seal, and Type 1 PVC pipe end plugs. The seals and end plugs shall resist chlorine gas and acid.

2.2 RECTIFIERS AND ASSOCIATED EQUIPMENT

2.2.1 Rectifier Unit

Rectifier unit shall consist of a transformer, rectifying elements, transformer tap adjuster, terminal block, one dc output voltmeter, one dc output ammeter, one toggle switch for each meter, fuse holders with fuses for each dc circuit, variable resistors, an ac power-supply circuit breaker, lightning arresters for both input and output, all wired and assembled in a weatherproof metal cabinet. The overall efficiency of the rectifier shall be not less than 65 percent when operated at nameplate rating and shall be capable of supplying continuous full rated output at an ambient temperature of 112 degF in full sunlight with expected life in excess of 10 years.

2.2.1.1 Transformer

Transformer shall conform to UL 506.

2.2.1.2 Rectifiers

Rectifying elements shall be selenium cells connected in such manner as to provide full-wave rectification.

2.2.1.3 Meters

Meters shall be accurate to within plus or minus 2 percent of full scale at 80 degF and shall possess temperature stability above and below 80 degF of at least 1 percent per 10 degF. Separate meters shall be 2-1/2 inch nominal size or larger.

2.2.1.4 Circuit Breaker

A single-pole, flush-mounted, fully magnetic, properly rated nonterminal type circuit breaker shall be installed in the primary circuit of the rectifier supply transformer.

2.2.1.5 Fuses

Cartridge-type fuses conforming with suitable fuse holders shall be provided in each leg of the dc circuit.

2.2.2 Cabinet Construction

Cabinet shall be constructed of not lighter than No. 16-gauge steel, and shall be provided with a full door. The door shall be hinged and have a hasp that will permit the use of a padlock. The cabinet shall be fitted with screened openings of the proper size to provide for adequate cooling. Holes, conduit knockouts, or threaded hubs of sufficient size and number shall be conveniently located.

2.2.2.1 Wiring Diagram

A complete wiring diagram of the power unit showing both the ac supply and the dc connections to anodes shall be on the inside of the cabinet door. All components shall be shown and labeled.

2.2.2.2 Grounding Provisions

Grounding provisions shall comply with NFPA 70 and UL 467, including a grounding terminal in the cabinet. The grounding conductor from the terminal to the earth grounding system shall be solid or stranded copper not smaller

than No. 6 AWG. The earth grounding system shall consist of one or more 5/8-inch diameter copper-clad steel rods. Ground rods shall be 8 feet.

2.2.2.3 Cabinet Paint System

The cabinet and mounting support shall be hot-dipped galvanized and painted with the manufacturer's standard painting system.

2.2.3 Wiring

Wiring shall be installed in accordance with NFPA 70 utilizing type TW or RHW or polyethylene insulation. Fittings for conduit and cable work shall conform to UL 514A. Outlets shall be of the threaded hub type with gasketed covers. Condu1it shall be hub type with gasketed covers. Conduit shall be securely fastened at 8-foot intervals or less. Splices shall be made in outlet fittings only. Conductors shall be color coded for identification. Cable for anode header and distribution shall be No. 2 AWG stranded copper wire with type Dular/Halar.

2.2.4 Oil-Immersed Enclosures

Enclosures shall be of 11-gauge steel or heavier, with an accessible drain plug. The oil level shall be clearly marked. The lid shall be hinged and have quick release clamps to secure it in closed position. A stop shall limit the swing of the lid when opened. A compressible, oil resistant, positive sealing gasket shall be provided. The gasket shall return to its original shape upon release of lid pressure. The gasket shall be attached to the tank or lid and joints shall be free of gaps. Base mounting using high channels shall be provided. All conduit entering the enclosure shall be internally sealed and should enter or exit above the oil fill line. This enclosure shall not be used in an area prone to flooding unless required for hazardous locations. Provisions should then be made for flooding.

2.3 COKE BREEZE

2.3.1 Calcined Petroleum Coke Breeze (Dry)

Breeze shall conform to the following requirements:
2.3.1.1 Electrical Resistivity

1.0 to 2.0 ohm-centimeter tightly compacted.

10 to 15 ohm-centimeter loosely compacted.

2.3.1.2 Bulk Density

Forty-eight to seventy-four pounds per cubic foot.

2.3.2 Metallurgical Coke Breeze (Processed)

Breeze shall conform to the following requirements:

2.3.2.1 Electrical Resistivity (Nominal)

10 ohm-centimeter Max., tightly compacted.

10 to 15 ohm-centimeter lightly compacted.

15 to 20 ohm-centimeter loose.

2.3.2.2 Bulk Density

Thirty-eight to forty-two pounds per cubic foot.

2.4 MISCELLANEOUS MATERIALS

2.4.1 Electrical Wire

2.4.1.1 Anode Wire

Anode wire attached to the feeder cable shall be grade 1 CP titanium, 1/8" inch diameter and coated with a Mixed Metal Oxide Ceramic. Cable-to-anode contact resistance shall be 0.003 ohms maximum.

2.4.1.2 Anode Cable

The feeder cable to which the wire anode is attached piggyback and the lead wire for distribution, including lead wire for the canister anodes shall be No. 8 AWG stranded copper wire with type CP high molecular weight polyethylene, 7/64-inch thick insulation, 600-volt rating, in accordance with NEMA WC 5.

2.4.1.3 Test Wires

Test wires shall be AWG No. 10 stranded copper wire with NFPA 70 Type TW or RHW or polyethylene insulation.

2.4.1.4 Resistance Wire

Resistance wire shall be AWG No. 16 or No. 22 nickel-chromium wire.

2.4.2 Conduit
Rigid galvanized steel conduit and accessories shall conform to UL 6. Non-metallic conduit shall conform to NEMA TC 2.

2.4.3 Test Boxes and Junctions Boxes

Boxes shall be outdoor type conforming to UL 514A.

2.4.4 Polyethylene Insulation

Polyethylene insulation shall comply with the requirements of ASTM D 1248 and of the following types, classes, and grades:

2.4.4.1 High Molecular Weight Polyethylene

High molecular weight polyethylene shall be Type I, Class C, Grade E5.

2.4.4.2 High Density Polyethylene

High density polyethylene shall be Type III, Class C, Grade E3.

2.4.5 Test Stations

Test stations shall be complete with an insulated terminal block having the required number of terminals plus two (2) spares and shall be provided with a lockable cover and have a cast-in legend, "C.P. Test". Test stations shall be complete with an insulated terminal block having the required number of terminals. (One terminal required for each conductor.) Sufficient test stations to monitor underground isolation points shall be provided. Test-bond

stations (potential measurement and stray current control) shall be provided to monitor pipe-to-soil potential of all underground pipes which are part of this system or existing underground metallic structures which may conduct stray current from the new cathodic protection system. Test-bond stations shall be located such that pipe-to-soil potential measurements may be made on all underground pipes and all existing underground metallic surfaces subject to stray current to assure that the pipe-to-soil potential of metallic pipe not designated to be protected by the new cathodic protection system is not made less negative by the energization of the cathodic protection system. Test station terminal connections and the terminal conductor shall be permanently tagged to identify each termination of the conductors. An example is to identify the conductors connected to the protected structures. Conductors shall be permanently identified in the station by means of plastic or metal tags, or plastic sleeves to indicate termination. Each conductor shall be color coded in accordance with drawings. Each termination location shall be identified as described. The station test facility, including permanent Cu-Cu S04 reference cells and test returns shall be installed as indicated on the drawings. Abbreviations shall not be used.

Welding of electrical connections shall be done as follows:

Exothermic welds shall be "CADweld", "Thermo-weld", or an approved equal. Use and selection of this material and welding equipment shall be in strict accordance with the manufacturer's recommendations.

2.4.5.1 Pavement Inserts

Pavement inserts shall be non-metallic and installed in a manner to allow copper/copper sulfate reference electrode to contact the electrolyte beneath the pavement/concrete.

2.4.6 Calibrated Shunts

Shunts shall conform to MS MIL-I-1361. Shunts calibrated in current per potential (e.g., mA/V) shall be installed between the lead or header wire connected to the sacrificial anode(s) and the current collector lead connected to the structure. The calibration of the shunt shall be clearly marked and installed to be visible.

2.4.7 Joint, Patch, Seal, and Repair Coating

2.4.7.1 Sealing and Dielectric Compound

Sealing and dielectric compound shall be a black, rubber based compound that is soft, permanently pliable, tacky, moldable, and unbacked. Compound shall be applied as recommended by the manufacturer, but not less than 1/8-inch thick.

2.4.7.2 Protective Covering (Coating for Underground Metallic Components including Pipe, Conduit and Fittings)

Except as otherwise specified, protective coverings shall be applied mechanically in a factory or field plant especially equipped for the purpose. Valves and fittings that cannot be coated and wrapped mechanically shall have the protective covering applied by hand, preferably at the plant that applies the covering to the pipe. Joints shall be coated and wrapped by hand. Hand coating and wrapping shall be done in a manner and with materials that will produce a covering equal in thickness to that of the covering applied mechanically. Piping and components installed in valve boxes or manholes shall also receive the specified protective coating.

2.4.7.2.1 Metallic Pipeline and Components

All underground metallic pipes, conduit and components shall be afforded a good quality coating. This includes all carbon steel, cast iron and ductile iron pipelines or vessels. If non-metallic pipelines are installed, all metallic fittings or pipe sections are to be coated in accordance with this specification.

The following coating materials and application thicknesses are required.

a. The nominal thickness of the metallic pipe joint or other component coating shall be 16 mils, plus or minus 5 percent.

b. Pipe and joint coating for factory applied or field repair material shall be applied as recommended by the manufacturer and shall be one of the following:

(1) Continuously extruded polyethylene and adhesive coating system.

(2) Polyvinyl chloride pressure-sensitive adhesive tape.

(3) High density polyethylene/bituminous rubber compound tape.

(4) Butyl rubber tape

(5) Coal tar epoxy

2.4.7.2.2 Field Joints

All field joints shall be coated with materials compatible with the pipeline coating compound. The joint coating material shall be applied to an equal thickness as the pipeline coating.

Under no circumstances shall unbonded coatings be used on buried metallic piping. This includes the elimination of all unbonded polymer wraps or tubes.

2.4.7.2.3 Inspection of Pipe Coatings and Holiday Test

Once the pipeline or vessel is set in the trench, an inspection of the coating shall be conducted. This inspection shall include electrical holiday detection. Any damaged areas of the coating shall be properly repaired. Any damage to the protective covering during transit and handling shall be repaired before installation. After field coating and wrapping has been applied, the entire pipe shall be inspected by an electric holiday detector with impressed current in accordance with NACE RP-0188-90 using a full-ring, spring-type coil electrode. The holiday detector shall be equipped with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. All holidays in the protective covering shall be repaired immediately upon detection. Occasional checks of holiday detector potential will be made by the Contracting Officer to determine suitability of the detector. All labor materials and equipment necessary for conducting the inspection shall be furnished by the contractor.

2.4.7.2.4 Protective Covering for Above Ground Piping System

Above ground piping shall be given 2 coats of exterior oil paint. Surface preparation shall be in accordance with recommendations of paint manufacturer. Exceptions are as follows: ferrous, shop primed surfaces shall be touched up with ferrous metal primer. Surfaces that have not been shop primed shall be solvent-cleaned. Surfaces that contain loose rust, loose mil scale, or other

foreign substances shall be mechanically cleaned by power wire brushing and primed with ferrous metal primer. Primed surface shall be finished with two coats of exterior oil paint or vinyl paint.

2.4.7.3 Preformed Sheaths

Preformed sheaths for encapsulating electrical wire splices to be buried underground shall fit the insulated wires entering the spliced joint.

2.4.7.4 Epoxy Potting Compound

Epoxy potting compound for encapsulating electrical wire splices to be buried underground shall be a two package system made for the purpose.

2.4.7.5 Backfill Shields

Backfill shields shall consist of approved pipeline wrapping or fiberglass reinforced, coal-tar impregnated tape, or plastic weld caps, specifically made for the purpose.

2.4.7.6 Electrical Tape

Pressure-sensitive vinyl plastic electrical tape shall conform to UL 510.

2.4.7.7 Cable Marker Tape

Traceable marker tape shall be manufactured for the purpose and clearly labeled "Cathodic Protection Cable" buried below.

2.4.8 Electrically-Insulating Pipe Joints

Electrically-insulating pipe joints for above or below ground use shall be flexible, mechanical pipe couplings of an electrically insulating type consisting of bolted or compression design provided with electrically insulating joint harness if required to provide pull-out strength.

2.4.8.1 Threaded Fittings

Threaded type electrically-insulating pipe joints shall have molded plastic screw threads and be used above ground only. Machined plastic screw threads shall not be used.

2.4.8.2 Electrically-Insulating Pipe Joints

Electrically-insulating pipe joints shall be of a type that is in regular factory production.

2.4.9 Electrically-Conductive Couplings

Electrically-conductive couplings shall be of a type that has a published maximum electrical resistance rating given in the manufacturer's literature. Cradles and seals shall be of a type that is in regular factory production made for the purpose of electrically insulating the carrier pipe from the casing and preventing the incursion of water into the annular space.

2.4.10 Joint and Continuity Bonds

Bonds shall be provided across all joints in gas pipes or across any electrically- discontinuous connections in the piping, and all other pipes and structures with other than welded or threaded joints that are included in this

cathodic protection system. Unless otherwise specified in these specifications, bonds between structures and across joints in pipe with other than welded or threaded joints shall be with No. 4 AWG stranded copper cable with polyethylene insulation. Bonds between structures shall contain sufficient slack for any anticipated movement between structures. Bonds across pipe joints shall contain a minimum of 4 inches of slack to allow for pipe movement and soil stress. Bonds shall be attached by exothermic welding. Exothermic weld areas shall be insulated with coating compound and approved, and witnessed by the Contracting Officer. Continuity bonds shall be installed as necessary to reduce stray current interference. Additional joint bonding shall be accomplished by the Contractor where the necessity is discovered during construction or testing or where the Contracting Officer directs that such bonding be done. Joint bonding shall include all associated excavation and backfilling. There shall be a minimum of two (2) continuity bonds between each structure and other than welded or threaded joints. Electrical continuity shall be tested across all joints with other than welded or threaded joints and across all metallic portions of the sewage lift stations and water booster station. Bonding shall be provided as required and as specified above until electrical continuity is achieved. Bonding test data shall be submitted for approval.

2.4.10.1 Resistance Bonds

Resistance bonds should be adjusted for minimum interference while achieving the criteria of protection. Alternate methods may be used if they are approved by the Contracting Officer.

2.4.10.2 Stray Current Measurements

Stray current measurements should be performed as indicated. Alternate methods may be used if they are approved by the Contracting Officer. The stray current test report will indicate location of test, type pipes tested, method of testing.

2.4.11 Electrical Isolation of Structures

As a minimum, insulating flanges or unions shall be provided at the following locations:

(1) Connection of new pipes to existing pipes.

(2) Pressure piping under floor slab to a building.

Additionally, isolation shall be provided between new pipe lines; and foreign pipes that cross the new lines within 10 feet.

2.4.11.1 General

Insulating fittings, including insulating flanges and couplings, shall be installed aboveground or in a concrete hand hole.

2.5 MAGNESIUM ANODES

Dimensions and weights of anodes shall be approximately as follows:

TYPICAL MAGNESIUM ANODE SIZES

(Cross sections may be round, square, or D shaped)

NOMINAL WT. LBS.	APPROX. SIZE (IN.)	NOMINAL GROSS WT LBS PACKAGED IN BACKFILL	NOMINAL PACKAGE DIMENSIONS (IN.)
3	3 X 3 X 5	8	5¼ X 5¼ X 8
5	3 X 3 X 8	13	5¼ X 5¼ X 11¼
9	3 X 3 X 14	27	5¼ X 20
12	4 X 4 X 12	32	7½ X 18
17	4 X 4 X 17	45	7½ X 24
32	5 X 5 X 20½	68	8½ X 28
50	7 X 7 X 16	100	10 X 24

2.5.1 Composition

Anode shall be of high potential magnesium alloy, made of primary magnesium obtained from sea water or brine, and not made from scrap metal. Anodes shall conform to the following analysis, unless otherwise indicated:

Element	Percent by Weight
Aluminum	0.02 maximum
Manganese	1.5 maximum
Zinc	0.05
Silicon	0.10 maximum
Copper	0.02 maximum
Nickel	0.002 maximum
Iron	0.03 maximum
Other impurities	0.30 maximum
Magnesium	Remainder

The Contractor shall furnish spectrographic analyses on samples from each heat or batch of anodes used on this project.

2.5.2 Packaged Anodes

Anodes shall be provided in packaged form with the anode surrounded by specially prepared quick-wetting backfill and contained in a cloth or paper sack. Anodes shall be centered in the backfill material. The backfill material shall have the following composition, unless otherwise indicated:

Material	Percent by Weight
Gypsum	75
Bentonite	20
Sodium Sulfate	5

2.5.3 Lead Wires

Anode lead wires shall consist of No. 10 solid copper wire, with TW insulation. Lead wires on all anodes shall be not less than 10 feet in length, without splices.

2.5.4 Connection Wires

Wires shall consist of No. 10 solid copper wire with RHW-USE or polyethylene insulation.

2.5.5 Insulation

Type RHW-USE insulation shall comply with the requirements of Federal Spec. J-C-30.

Polyethylene insulation shall comply with the requirements of ASTM D 1248 and shall be of the following types, classes, and grades:

High-molecular weight polyethylene shall be Type I, Class C, Grade E5.

High-density polyethylene shall be Type III, Class C, Grade E3.

2.5.6 Conduit Steel

Conduit steel shall meet UL 6 and ANSI C 80.1.

2.5.7 Tape

Pressure-sensitive vinyl plastic electrical tape shall comply with the requirements of Federal Spec. HH-I-595.

2.5.8 Backfill Shields

Shields shall consist of approved pipeline wrapping of fiberglass reinforced, coal-tar impregnated tape, or plastic weld caps, specifically made for the purpose and installed in accordance with the manufacturer's recommendations. When joint bonds are required, due to the use of mechanical joints, the entire joint shall be protected by the use of a kraft paper joint cover. The joint cover shall be filled with poured-in, hot coal-tar enamel.

2.5.9 Test Stations

Test stations shall be of the flush to ground type as shown, and shall be the standard product of a recognized manufacturer, or shall be fabricated as detailed. Test stations shall be complete with an insulated terminal block having required number of terminals. The test station shall be provided with a lockable cover and shall have a cast-in legend, "C.P. Test". A minimum of one spare terminal shall be provided in each test station. A minimum of five (5) test stations shall be provided.

Resistance wire shall be No. 16 or No. 22 nickel-chromium wire with TW insulation.

2.5.10 Electrical Connections

Electrical connections shall be done as follows:

(1) Exothermic welds shall be "Cadweld" or Burndy "Thermo-Weld" or an approved equal. Use of this material shall be in strict accordance with the manufacturer's recommendations.

(2) Electrical shielded arc welds shall be approved for use on steel pipe by shop drawing submittal action.

(3) Other methods of welding shall be specifically approved for use by the pipe manufacturer.

(4) Brazing as permitted hereinafter.

2.5.11 Anode Storage

Storage for magnesium anodes will be designated by the Contracting Officer. If anodes are not stored in a building, tarps or similar protection should be used to protect anodes from inclement weather. Packaged anodes, damaged as a result of improper handling or being exposed to rain, shall be resacked by the Contractor and the required backfill added.

2.5.12 Anode Installation

Unless otherwise authorized, installation shall not proceed without the presence of a representative of the Contracting Officer. Anodes of the size specified shall be installed at the locations indicated. Locations may be changed to clear obstructions with the approval of the Contracting Officer. Anodes shall be installed in sufficient number and of the required type, size, and spacing to obtain a uniform current distribution surface on the structure. The anode system shall be planned for a life of 25 years of continuous operation.

Installation details shall conform to the requirements of this specification, and shall be as detailed on the drawings. Details shown are indicative of the general type of material required and not intended to restrict selection to material of any particular manufacturer.

2.6 LEAD WIRE CONNECTIONS

2.6.1 Underground Pipe Line Steel

To facilitate periodic electrical measurements during the life of the sacrificial anode system and to reduce the output current of the anodes if required, all anode lead wires in a single group of anodes shall be buried a minimum of 24 inches in depth and each anode lead wire shall be connected to an individual terminal in a test station. The anode lead cable shall be as specified above. The cable shall make contact with the structure only through a test station. Resistance wire shall be installed between the anode lead cable and the pipe cable, in the test station to reduce the current output, if required. Lead wire-to-structure connections shall be accomplished by an exothermic welding process. All welds shall be in accordance with the manufacturer's recommendations. Weld charges made especially for use on cast iron shall be used on cast iron pipe. A backfill shield filled with a pipeline mastic sealant or material compatible with the coating shall be placed over the weld connection and shall be of such diameter as to cover the exposed metal adequately.

2.6.2 Lead and Resistance Wire Splices

All lead wire splicing, when necessary, shall be made with copper split bolt connectors of proper size. The joint shall be carefully wrapped with at least three (3) layers of electrical tape. Resistance wire connections shall be accomplished with silver solder and the solder joints wrapped with a minimum of three (3) layers of pressure-sensitive tape.

PART 3 EXECUTION

3.1 CRITERIA OF PROTECTION

Acceptance criteria for determining the adequacy of protection on a buried pipe shall be in accordance with NACE RP0169 (92 edition) and the following:

3.1.1 Iron and Steel

The following methods shall apply:

A negative voltage of at least minus 0.85 volts as measured between the pipe and underground component as specified and a saturated copper-copper sulphate reference electrode contacting the (electrolyte) earth directly over the pipe and underground component as specified. Determination of this voltage shall be made with the cathodic protection system in operation. Voltage drops shall be considered for valid interpretation of this voltage measurement. A minimum of minus 850 millivolts "instant off" potential between the pipe and underground component as specified being tested and the reference cell shall be achieved over 95% of the area of the structure. Adequate numbers of measurements shall be obtained over the entire structure, pipe, tank, or other metallic component to verify and record achievement of minus 850 millivolts "instant off". This potential shall be obtained over 95% of the total metallic area. This must be achieved without the "instant off" potential exceeding 1200 millivolts.

3.2 GROUND BED INSTALLATION

3.2.1 Shallow Ground Beds

Shallow ground beds shall contain size and quantity of anodes designed to meet performance criteria of the cathodic protection system at an initial operating current output density not exceeding 50 percent of maximum recommended current output density.

3.2.1.1 Horizontally-Buried Bare Anodes

Horizontally-buried bare anodes shall be bedded on and covered with metallurgical coke breeze in a trench excavated for the purpose at depths, spacing and locations as shown. Anodes shall be completely surrounded by the backfill at bottom, sides, and top for a distance of not less than 4 inches. Backfill shall be compacted.

3.2.1.2 Vertically-Buried Canister-Contained Anodes

Vertically-buried canister-contained anodes shall be installed in vertical holes in the ground having depth, spacing, and locations shown. The holes in the ground shall be sufficiently larger in diameter than the canisters to facilitate easy lowering into the hole and backfilling. The space between the canister and the wall of the hole shall be completely backfilled with a wet slurry of earth free of stones.

3.2.1.3 Cable Protection

Positive cable to the ground bed and negative cable to the pipe to be protected shall be buried a minimum depth of 30 inches except where above ground construction utilizing conduit is used.

Wire

Each anode shall have a separate, continuous wire extending from the anode in the well to the terminal cabinet located at the rectifier.

3.2.2.3 Anode Cables

Anode cables shall terminate in a nearby junction box, equipped with individual anode current shunts. Where full length casing is used, two wire connections from casing shall terminate in the junction box.

3.2.2.4 Anode and Cable Installation

If the method of installation utilizes backfill support for anodes and cable, slack in the cable near each anode shall be provided and the cable insulation shall be increased in thickness from 7/64 inch to 5/32 inch utilizing an approved composite of plastic and elastomeric materials.

3.2.2.5 Backfill

The well shall be backfilled with calcined petroleum coke breeze or metallurgical coke breeze surrounding the anodes by a method that does not leave voids or bridging. The well shall be over-filled with coke breeze allowing for settlement so that the settled level after a number of days is as high as the level shown. The number of days allowed for settling of the coke breeze shall be determined by the Contracting Officer. If the top level of coke breeze is below the level shown after settlement, additional coke breeze shall be put in the well. Anode and cable assemblies shall not be used for tamping backfill around another, previously placed anode unless recommended in writing by the manufacturer of the anode and cable assembly. The top portion of the well above the level of the coke breeze shall be filled with washed gravel.

The top of the well shall be vented to atmosphere.

3.2.2.6 Cable Marker Tape

Traceable marker tape shall be located in the same trench above all cathodic protection cables, to include structure leads, anode leads, anode header cables, test station leads, bonding cables, and rectifier electrical power cables.

3.2.2.7 Pavement Inserts

Pavement inserts will be installed to allow all required testing a minimum of 100-foot intervals for pipelines. The pavement inserts shall be installed directly over the structure wherever the structure being protected is covered by concrete or asphalt and such testing is required.

3.3 MAGNESIUM ANODE INSTALLATION

Unless otherwise authorized, installation shall not proceed without the presence of a representative of the Contracting Officer. Anodes of the size specified shall be installed at the locations indicated. Locations may be changed to clear obstructions with the approval of the Contracting Officer. Anodes shall be installed in sufficient number and of the required type, size, and spacing to obtain a uniform current distribution surface on the structure. The anode system shall be designed for a life of 25 years of continuous operation. Prepackaged anodes shall be installed as shown on the drawings.

Installation details shall conform to the requirements of this specification, and shall be as detailed on the drawings. Details shown are indicative of the general type of material required and not intended to restrict selection to material of any particular manufacturer.

3.3.1 Anode Placement - General

Packaged anodes shall be installed completely dry, and shall be lowered into holes by rope sling or by grasping the cloth gather. The anode lead wire shall be used in lowering the anodes. The hole shall be backfilled with fine soil in 6-inch layers and each layer shall be hand-tamped around the anode. Care must be exercised not to strike the anode or lead wire with a tamper. If immediate testing is to be performed, water shall be added only after backfilling and tamping has been completed to a point 6 inches above the anode. Approximately 2 gallons of water may be poured into the hole. After the water has been absorbed by the soil, back filling and tamping may be completed to the top of the hole. Anodes shall be installed as shown. In the event a rock strata is encountered prior to achieving specified augered-hole depth, anode may be installed horizontally to a depth at least as deep as the bottom of the pipe, with the approval of the Contracting Officer.

3.3.2 Underground Pipe Line

Anodes shall be installed 2 feet below the line to be protected unless otherwise noted on drawings.

3.3.3 Lead Wire Connections

3.3.3.1 Underground Pipe Line Steel

To facilitate periodic electrical measurements during the life of the sacrificial anode system and to reduce the output current of the anodes if required, all anode lead wires in a single group of anodes shall be buried a minimum of 24 inches in depth and each anode lead wire shall be connected to an individual terminal in a test station. The anode lead cable shall be as specified above. The cable shall make contact with the structure only through a test station. Resistance wire shall be installed between the anode lead cable and the pipe cable, in the test station to reduce the current output, if required. Lead wire-to-structure connections shall be accomplished by an exothermic welding process. All welds shall be in accordance with the manufacturer's recommendations. Weld charges made especially for use on cast iron shall be used on cast iron pipe. A backfill shield filled with a pipeline mastic sealant or material compatible with the coating shall be placed over the weld connection and shall be of such diameter as to cover the exposed metal adequately.

3.3.3.2 Lead and Resistance Wire Splices

All lead wire splicing, when necessary, shall be made with copper split bolt connectors of proper size. The joint shall be carefully wrapped with at least three (3) layers of electrical tape. Resistance wire connections shall be accomplished with silver solder and the solder joints wrapped with a minimum of three (3) layers of pressure-sensitive tape.

3.4 MISCELLANEOUS INSTALLATION

3.4.1 Rectifier Installation

Mounting shall be as shown. Cross-arm brackets shall accommodate a 4-inch by 4-inch cross-arm.

3.4.2 Wire Connections

3.4.2.1 Wire Splicing

Connecting wire splicing shall be made with copper compression connectors or exothermic welds, following instructions of the manufacturer. Split-bolt type connectors shall not be used.

3.4.2.2 Steel Surfaces

Connections to ferrous pipe shall be made by exothermic weld methods as manufactured by an approved manufacturer for the type of pipe. Electric arc welded connections and other types of welded connections to ferrous pipe and structures shall be approved before use.

3.4.3 Pipe Joints

3.4.3.1 Electrical Continuity

Underground pipe shall be electrically continuous except at places where electrically insulating joints are specified. Pipe joined by means other than welding shall meet the following electrical continuity requirements:

a. Mechanical joints that are not factory designed to provide electrical continuity shall be bonded by installing a metallic bond across the joint. The bonding connections shall be made by the exothermic welding process.

b. Mechanical joints designed to provide electrical continuity may be used.

3.4.3.2 Coating

Mechanical joints and fittings of either the electrically conductive or insulating type shall be coated with an underground type dielectric coating system. Where external electrical continuity bonds are installed across mechanical joints, all bare or exposed metal, welds, bare wire and exposed coupling parts shall be coated with a coating system.

a. Couplings and fittings which have a low profile exterior designed to permit tape coating shall be primed and wrapped with an underground type pipe tape following recommendations of the coupling or fitting manufacturer.

b. Couplings and fittings that cannot be properly taped shall be enclosed in a shroud of reinforced kraft paper and filled with cold-applied dielectric compound.

3.4.3.3 Electrical Isolation of Structures

Electrical isolation of structures shall be as follows:

a. Insulating Fittings: Insulating flanges and couplings shall be installed aboveground, or within manholes, wherever possible, but an insulating device that electrically separates a pipeline shall not be installed in a confined area where a combustible atmosphere may collect unless precautions are taken to prevent arcing such as by means of externally located surge arresters, grounding cells, or other means. Insulating flanges and couplings in lines entering buildings shall be located at least 12 inches above grade or floor level. Pipelines entering buildings either below or above ground shall be electrically isolated from the structure wall with an electrically isolating and gas tight wall sleeve.

b. Gas Distribution Piping: Electrical isolation shall be provided at each building riser pipe to the pressure regulator, at all points where a short circuit to another structure or to a foreign structure may occur, and at other locations as indicated.

3.4.4 Dissimilar Metals

Buried piping of dissimilar metals including new and old steel piping, excepting valves, shall be electrically separated by means of electrically insulating joints at every place of connection. The insulating joint, including the pipes, shall be coated with an underground type dielectric coating for a minimum distance of 10 diameters on each side of the joint.

3.4.5 Ferrous Valves

Dissimilar ferrous valves in a buried ferrous pipeline, including the pipe, shall be coated with an underground type dielectric coating for a minimum distance of 10 diameters on each side of the valve.

3.4.6 Brass or Bronze Valves

Brass or bronze valves shall not be used in a buried ferrous pipeline.

3.4.7 Metal Pipe Junction

If the dissimilar metal pipe junction, including valves, is not buried and exposed to atmosphere only, the connection or valve, including the pipe, shall be coated with an underground type dielectric coating for a minimum distance of 3 diameters on each side of the junction.

3.4.8 Casing

Where a pipeline is installed in a casing under a roadway or railway, the pipeline shall be electrically insulated from the casing, and the annular space sealed against incursion of water.

3.4.9 Test Stations

Test stations shall be of the type and location shown. Buried electrically insulating joints shall be provided with test wire connections brought to a test station. Changes in designated location must have prior approval. Unless otherwise shown, other test stations shall be located as follows:

a. At 1,000-foot intervals or less.

b. Where the pipe or conduit crosses any other metal pipe.

c. At both ends of casings under roadways and railways.

d. Where both ends of an insulating joint are not accessible above ground for testing purposes.

3.5 TESTS AND MEASUREMENTS

3.5.1 Baseline Potentials

Each test and measurement shall be witnessed by the contracting officer. The contractor shall notify the contracting officer a minimum of five (5) working

days prior to each test. All test data shall be submitted to the contracting officer for approval.

After backfill of the pipe and anodes is completed, but before the anodes are connected to the pipe, the static potential-to-soil of the pipe shall be measured. The locations of these measurements shall be identical to the locations specified for pipe.

3.5.2 Insulation Testing

Before the anode system is connected to the pipe, an insulation test shall be made at each insulating joint or fitting. This test shall demonstrate that no metallic contact, or short circuit exists between the two insulated sections of the pipe. Any insulating fittings installed and found to be defective shall be reported to the Contracting Officer.

A Model 601 insulation checker or an approved equal shall be used for insulating joint (flange) electrical testing. Manufacturer's operating instructions shall be strictly adhered to. Test shall be witnessed by the contracting officer.

An insulating joint that is good will read full scale on the meter. If an insulating joint is shorted, the meter pointer will be deflected or near zero on the meter scale. Location of the fault shall be determined per checker manufacturer's instructions and the insulating joint shall be repaired.

If an insulating joint is located inside a vault, the pipe shall be sleeved with insulator when entering and leaving the vault.

A model B3A2 cathodic protection meter or an approved equal using the continuity check circuit shall be used for insulating joint (flange) electrical testing. This test shall be performed in addition to the Model 601 insulation checker.

The test lead wire is shorted together, the meter adjusted to scale, then continuity is checked across the insulated joint. A full scale deflection indicates that the system is shorted at some location. The Model 601 verifies that the particular insulation under test is good and the Model B3A2 verifies that the system is isolated. If the system is shorted, further testing is required to isolate the location of the short.

3.5.3 Anode Output

As the anodes or groups of anodes are connected to the pipe current output shall be measured with an approved low resistance ammeter. The values obtained and the date, time, and locations shall be recorded.

3.5.4 Pipe-to-Reference Electrode Potential Measurements

Upon completion of the installation and with the entire cathodic protection system in operation, electrode potential measurements shall be made using a copper-copper sulphate reference electrode and a potentiometer-voltmeter, or a direct current voltmeter having an internal resistance (sensitivity) of not less than 10,000,000 ohms per volt (10 megohms per volt) and a full scale of ten (10) volts. The locations of these measurements shall be identical to the locations used for baseline potentials. The values obtained and the date, time, and locations of measurements shall be recorded.

In no case shall less than eight (8) measurements be made over any length of line or component. Additional measurements shall be made at each distribution

service riser, with the reference electrode placed directly over the service line.

3.5.5 Location of Measurements

3.5.5.1 For coated piping or conduit, measurements shall be taken from the reference electrode located in contact with the earth, directly over the pipe. Connection to the pipe shall be made at service risers, valves, test leads, or by other means suitable for test purposes. Pipe-to-soil potential measurements shall be made at intervals not exceeding 2.5 feet. The contractor at his option may use a continuous pipe to soil potential profile in lieu of 2.5 ft interval pipe-to-soil potential measurements. Additional measurements shall be made at each distribution service riser, with the reference electrode placed directly over the service line adjacent to the riser. All potentials shall be plotted versus distance to an approved scale. All locations where potentials do not meet or exceed the criteria shall be identified and reported to the Contracting Officer.

3.5.6 Casing Tests

Before final acceptance of the installation, the electrical separation of carrier pipe from casings shall be tested and any short circuits corrected at no expense to the government.

3.5.7 Interference Testing

Before final acceptance of the installation, interference tests shall be made with respect to any foreign pipes in cooperation with the owner of the foreign pipes. A full report of the tests giving all details shall be made.

3.5.8 Inspection of Pipe Coatings

Any damage to the protective covering during transit and handling shall be repaired before installation. After field coating and wrapping has been applied, the entire pipe shall be inspected by an electric holiday detector with impressed current in accordance with NACE RP 0188-90 using a full-ring, spring-type coil electrode. The holiday detector shall be equipped with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. All holidays in the protective covering shall be repaired immediately upon detection. Occasional checks of holiday detector potential will be made by the contracting officer to determine suitability of the detector. All labor materials and equipment necessary for conducting the inspection shall be furnished by the contractor. The coating system shall be inspected for holes, voids, cracks, and other damage during installation.

3.5.9 Recording Measurements

All pipe-to-soil potential measurements including initial potentials where required shall be recorded. The Contractor shall locate, correct and report to Contracting Officer any short circuits to foreign pipes encountered during checkout of the installed cathodic protection system. Pipe-to-soil potential measurements are required on as many pipes as necessary to determine the extent of protection or to locate short-circuits.

3.6 TRAINING COURSE

Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total of 8 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the operating and

maintenance instructions, as well as demonstrations of routine maintenance operations, including all testing procedures included in the maintenance instructions. At least 14 days prior to date of proposed conduction of the training course, the training course curriculum must be submitted to the Contracting Officer for approval, along with the proposed training date.

Training should consist of demonstration of the test equipment, providing forms for test data and the tolerances which indicate that this system is working satisfactorily.

END OF SECTION 16642