

**Memphis District**

**Invitation for Bid No. DACW66-99-B-0014**



**US Army Corps  
of Engineers®**

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**Project Title:**

**DRINKWATER PUMPING STATION NO. 2**

**Location:**

**BIG LAKE BASIN**

**MISSISSIPPI COUNTY, MISSOURI**

**Construction Solicitation  
and Specifications**

**THIS IS AN UNRESTRICTED SOLICITATION**

**Date: June 1999**

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<b>SOLICITATION, OFFER, AND AWARD</b> (Construction, Alteration, or Repair)	1. SOLICITATION NO.  DACW66-99-B-0014	2. TYPE OF SOLICITATION  <input checked="" type="checkbox"/> SEALED BID (IFB) <input type="checkbox"/> NEGOTIATED (RFP)	3. DATE ISSUED  06/17/99	PAGE OF PAGES
	IMPORTANT - The "offer" section on the reverse must be fully completed by offeror.			

4. CONTRACT NO.	5. REQUISITION/PURCHASE REQUEST NO.	6. PROJECT NO. DACW66-99-B-0014
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7. ISSUED BY  U S ARMY ENGINEER DISTRICT, MEMPHIS CONTRACTING DIVISION (CEVM-CT) 167 NORTH MAIN STRET B202 MEMPHIS, TN 38103-1894	CODE W38XGR	8. ADDRESS OFFER TO  ADDRESS SAME AS BLOCK 7. HAND DELIVERED BIDS RECEIVED IN ROOM 681, CLIFFORD DAVIS FEDERAL BUILDING, 167 NORTH MAIN STREET, MEMPHIS, TN
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9. FOR INFORMATION CALL:	A. NAME E. ANN TUCKER	B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS) (901) 544-0770
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**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):

The work required is for Drinkwater Pumping Station No. 2, Big Lake Basin, Mississippi County, Missouri.

Description of Work. The work consists of construction of a 2-bay pumping station with concrete substructure, metal building pump house, overhead crane, discharge pipes, and outlet structure. Each of the two pumping units consists principally of a vertical storm water pump, a diesel engine, and a right angle gear reducer, rated 75 cfs. The work includes clearing and grubbing, excavation, backfills and embankment, cofferdam construction and removal, dewatering, stone protection including plastic filter cloth and riprap, steel sheet piling, electrical work, painting, fertilizing and sodding, fertilizing and sprigging and environmental protection.

The estimated value of the proposed work is between \$5,000,000.00 and \$10,000,000.00.

11. The Contractor shall begin performance within 10 calendar days and complete it within 500 calendar days after receiving  award,  notice to proceed. This performance period is  mandatory,  negotiable. (See Sec. 00800, Para. 1.1 .)

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? (If "YES," indicate within how many calendar days after award in Item 12B.)  <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	12B. CALENDAR DAYS  10
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13. ADDITIONAL SOLICITATION REQUIREMENTS:

A. Sealed offers in original and 0 copies to perform the work required are due at the place specified in Item 8 by 02:30 (hour) local time 07/20/99 (date). If this is a sealed bid solicitation, offers must be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

B. An offer guarantee  is,  is not required.

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

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

14. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)  CEC NO.                      DUNS NO.  CODE                      FACILITY CODE	15. TELEPHONE NO. (Include area code)  16. REMITTANCE ADDRESS (Include only if different than Item 14)
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17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within \_\_\_\_\_ calendar days after the date offers are due. (Insert any number equal to or greater than the minimum requirement stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)

**AMOUNTS**

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
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**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)	ITEM	25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO  <input type="checkbox"/> 10 U.S.C. 2304(c) (    ) <input type="checkbox"/> 41 U.S.C. 253(c) (    )
26. ADMINISTERED BY                      CODE	27. PAYMENT WILL BE MADE BY	

**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 stated 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 incorporated by reference in or attached to this contract.

**29. AWARD** (Contractor is not required to sign this document.) Your offer on this solicitation, is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is 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

DRINKWATER PUMPING STATION NO. 2  
 B IG LAKE BASIN  
 MISSISSIPPI COUNTY, MISSOURI

SECTION 00010  
 SUPPLIES OR SERVICES AND PRICES/COSTS

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ESTIMATED QUANTITY</u>	<u>U/M</u>	<u>U/P</u>	<u>AMOUNT</u>
0001	Mobilization & Demobilization	1	JB	XXXX.XX	\$_____.
0002	Environmental Protection	1	JB	XXXX.XX	\$_____.
0003	Dewatering	1	JB	XXXX.XX	\$_____.
0004	Clearing and Grubbing	1	JB	XXXX.XX	\$_____.
0005	Geotextile (Filter Fabric)	1	JB	XXXX.XX	\$_____.
0006	Riprap "R 140"	1140	TN	_____.	\$_____.
0007	Grout for Riprap	1	JB	XXXX.XX	\$_____.
0008	Steel Sheet Piling PSA 23	1	JB	XXXX.XX	\$_____.
0009	Steel Sheet Piling PZ 27	1	JB	XXXX.XX	\$_____.
0010	Excavation	13,650	CY	_____.	\$_____.
0011	Pervious Backfill	2,330	CY	_____.	\$_____.
0012	Impervious Backfill and Permanent Embankment	13,600	CY	_____.	\$_____.
0013	Relief Wells	940	LF	_____.	\$_____.
0014	Water Well				
0014AA	First 500 Linear Feet Depth	500	LF	_____.	\$_____.
0014AB	All Over 500 Linear Feet Depth	300	LF	_____.	\$_____.
0015	Guard Rail	1	JB	XXXX.XX	\$_____.
0016	Aggregate Surfacing	1	JB	XXXX.XX	\$_____.
0017	Temporary Earthen Cofferdam Construction	1	JB	XXXX.XX	\$_____.
0018	6" Compacted Clay Gravel	1	JB	XXXX.XX	\$_____.
0019	Establishment of Turf	1	JB	XXXX.XX	\$_____.
0020	Pumping Station	1	JB	XXXX.XX	\$_____.
<b>Total Items 0001 through 0020</b>					<b>\$_____.</b>

SF = Square Foot  
 SY = Square Yard  
 CY = Cubic Yard

TN = Ton  
 EA = Each  
 JB = Job

LF = Linear Feet

Note: Bidders shall furnish unit prices for all items listed on the schedule of bid items that require unit prices. If the bidder fails to insert a unit price in the appropriate blank for required items, but does furnish an extended total or an estimated amount for such items, the Government will deem his unit price to be the quotient obtained by dividing the extended estimated amount for that line item by the quantity. IF THE BIDDER OMITTS BOTH THE UNIT PRICE AND THE EXTENDED ESTIMATED AMOUNT FOR ANY ITEM, HIS BID WILL BE DECLARED NONRESPONSIVE.

Award will be made as a whole to one bidder.

All quantities are estimated except where unit is given as "JB" or "EA".

Job (JB) units of measure indicate the same designation for a particular item of work including incidental work associated with the item.

If a bid or modification to a bid based on unit prices is submitted and provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price, including lump sum units, in bid schedule must be stated, or, if it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a pro rata basis to every unit price in the bid schedule.

Bidders are cautioned to read the contract clause entitled "Required Central Contractor Registration" located in section 00700.

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY FOR CONSTRUCTION. (FEB 1999)

a. The offeror’s attention is called to the Equal Opportunity Clause and the Affirmative Action Compliance Requirements for Construction clause 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 for each trade
Non-SMSA Counties	:	6.9
11.4	:	

These goals are applicable to all the Contractor’s construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

c. The Contractor’s compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled “Affirmative Action Compliance Requirements for Construction,” and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. 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, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

d. The Contractor shall provide written notification to the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, within 10 working days following 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 -

- (1) Name, address and telephone number of the subcontractor;
  - (i) Employer identification number of the subcontractor:
- (2) Estimated dollar amount of the subcontract;

(3) Estimated starting and completion dates of the subcontract; and

(4) 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 Economic Area 107, St. Louis, MO, as follows:

Non-SMSA Counties.....11.4

IL Alexander, IL Bond; IL Calhoun, IL Clay, IL Effingham, IL Fayette;  
IL Franklin; IL Greene, IL Jackson; IL Jasper; IL Jefferson, IL Jersey;  
IL Johnson; IL Macoupin; IL Marion; IL Montgomery; IL Perry,  
IL Pulaski; IL Randolph; IL Richland; IL Union; IL Washington;  
IL Wayne; IL Williamson; MO Bollinger; MO Butler; MO Cape Girardeau;  
MO Carter; MO Crawford; MO Dent; MO Gasconade; MO Iron;  
MO Lincoln; MO Madison; MO Maries; MO Mississippi;  
MO Montgomery; MO Perry; MO Phelps; MO Reynolds; MO Ripley;  
MO St. Francis; MO Ste. Genevieve; MO Scott; MO Stoddard;  
MO Warren; MO Washington; MO Wayne

(FAR 52.222-23)

General Decision Number MO990001

MO980001 General Decision Number MO990001 Superseded General Decision No.

State: Missouri

Construction Type:

HEAVY

HIGHWAY

County(ies):

STATEWIDE

HEAVY AND HIGHWAY CONSTRUCTION PROJECTS

Modification Number Publication Date

0	03/12/1999
1	04/09/1999
2	05/07/1999
3	06/11/1999

COUNTY(ies):

STATEWIDE

CARP0007M 04/01/1998

	Rates	Fringes
CASS (Richards-Gebauer AFB ONLY), CLAY, JACKSON, PLATTE AND RAY COUNTIES CARPENTERS & PILEDRIVERS	21.50	5.68

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CARP0008C 05/03/1995

	Rates	Fringes
ST. LOUIS COUNTY AND CITY CARPENTERS	23.19	4.77

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CARP0011A 05/01/1997

	Rates	Fringes
CARPENTERS & PILEDRIVERS: JEFFERSON AND ST. CHARLES COUNTIES	23.19	4.60
FRANKLIN COUNTY	21.08	4.60
WARREN COUNTY	21.08	4.60
LINCOLN COUNTY	20.69	4.60
PIKE, ST. FRANCOIS, AND WASHINGTON COUNTIES	19.74	4.60
BUCHANAN, CASS, CLINTON, JOHNSON AND LAFAYETTE COUNTIES	18.78	4.00
ATCHISON, ANDREW, BATES, CALDWELL, CARROLL, DAVIESS, DEKALB, GENTRY, GRUNDY, HARRISON, HENRY, HOLT, LIVINGSTON, MERCER, NODAWAY, ST. CLAIR, SALINE AND WORTH COUNTIES	18.13	4.00
CAMDEN, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY, LACLEDE, OZARK, POLK, STONE, TANEY, VERNON, WEBSTER, AND WRIGHT COUNTIES	17.88	4.00
CRAWFORD, DENT, GASCONADE, IRON, MADISON, MARIES, MONTGOMERY, PHELPS, PULASKI, REYNOLDS, SHANNON, AND TEXAS COUNTIES	19.03	3.80
AUDRAIN, BOONE, COOPER, AND HOWARD		

COUNTIES	20.48	4.80
BENTON, MORGAN AND PETTIS COUNTIES	19.18	4.80
LEWIS, MARION, AND RALLS COUNTIES	20.48	4.80
CALLAWAY, COLE, MILLER, MONITEAU, AND OSAGE COUNTIES	20.48	4.80
ADAIR, CLARK, KNOX, PUTNAM, SCHUYLER, SCOTLAND AND SULLIVAN COUNTIES	20.48	4.80
CHARITON, LINN, MACON, MONROE, RANDOLPH, AND SHELBY COUNTIES	20.48	4.80
BOLLINGER, BUTLER, CAPE GIRARDEAU, DUNKLIN, MISSISSIPPI, NEW MADRID, PEMISCOT, PERRY, STE. GENEVIEVE, SCOTT, STODDARD AND WAYNE COUNTIES	20.65	3.70
CARTER, HOWELL, OREGON AND RIPLEY COUNTIES	19.78	3.70

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 CARP0311H 08/01/1998

	Rates	Fringes
BARRY, BARTON, JASPER, LAWRENCE, MCDONALD AND NEWTON COUNTIES CARPENTERS:		
Carpenters and Lathers	15.32	5.00
Millwrights and Piledrivers	15.57	5.00

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 \* ELEC0001B 06/01/1999

	Rates	Fringes
BOLLINGER, BUTLER, CAPE GIRARDEAU, CARTER, DUNKLIN, FRANKLIN, IRON, JEFFERSON, LINCOLN, MADISON, MISSISSIPPI, NEW MADRID, PEMISCOT, PERRY, REYNOLDS, RIPLEY, ST. CHARLES, ST. FRANCOIS, ST. LOUIS (City and County), STE. GENEVIEVE, SCOTT, STODDARD, WARREN, WASHINGTON AND WAYNE COUNTIES ELECTRICIANS	25.65	13.74

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 ELEC0002D 09/01/1998

	Rates	Fringes
ADAIR, AUDRAIN, BOONE, CALLAWAY, CAMDEN, CARTER, CHARITON, CLARK, COLE, COOPER, CRAWFORD, DENT, FRANKLIN, GASCONADE, HOWARD, HOWELL, IRON, JEFFERSON, KNOX, LEWIS, LINCON, LINN, MACON, MARIES, MARION, MILLER, MONITEAU, MONROE, MONTGOMERY, MORGAN, OREGON, OSAGE, PERRY, PHELPS, PIKE, PULASKI, PUTNAM, RALLS, RANDOLPH, REYNOLDS, RIPLEY, ST. CHARLES, ST. FRANCOIS, ST. LOUIS (City and County), STE. GENEVIEVE, SCHUYLER, SCOTLAND, SHANNON, SHELBY, SULLIVAN, TEXAS, WARREN AND WASHINGTON COUNTIES. LINE CONSTRUCTION:		
Lineman & Cable Splicer	24.42	41% + 2.00
Groundman Equipment Operator	21.87	41% + 2.00
Groundman Winch Driver	17.97	41% + 2.00
Groundman, Groundman Driver	17.31	41% + 2.00

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 ELEC0053F 09/01/1996

	Rates	Fringes
BATES, BENTON, CARROLL, CASS, CLAY, HENRY, JACKSON, JOHNSON, LAFAYETTE, PETTIS, PLATTE, RAY, AND SALINE COUNTIES. LINE CONSTRUCTION:		
Lineman	24.46	7.88
Lineman Operator	22.84	7.50

Groundman Powderman	17.12	6.11
Groundman	16.27	5.91

ANDREW, ATCHINSON, BARRY, BARTON, BUCHANAN, CALDWELL, CEDAR, CHRISTIAN, CLINTON, DADE, DALLAS, DAVIESS, DE KALB, DOUGLAS, GENTRY, GREENE, GRUNDY, HARRISON, HICKORY, HOLT, JASPER, LACLEDE, LAWRENCE, LIVINGSTON, McDONALD, MERCER, NEWTON, NODAWAY, OZARK, POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER, WORTH, AND WRIGHT COUNTIES.

LINE CONSTRUCTION:

Lineman	23.53	7.66
Lineman Operator	22.36	7.37
Groundman Powderman	16.45	5.95
Groundman	15.22	5.65

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 \* ELEC0095C 06/01/1999

	Rates	Fringes
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BARRY, BARTON, CEDAR, CRAWFORD, DADE, JASPER, LAWRENCE, MCDONALD, NEWTON, ST CLAIR, AND VERNON COUNTIES

ELECTRICIANS:

Electricians	18.51	5.52
Cable Splicers	18.86	5.52

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 ELEC0124I 08/31/1998

	Rates	Fringes
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BATES, BENTON, CARROLL, CASS, CLAY, COOPER, HENRY, JACKSON, JOHNSON, LAFAYETTE, MORGAN, PETTIS, PLATTE, RAY AND SALINE COUNTIES:

ELECTRICIANS	24.06	7.85+10%
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 ELEC0257C 03/01/1995

	Rates	Fringes
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AUDRAIN (Except, Cuivre Township), BOONE, CALLAWAY, CAMDEN, CHARITON, COLE, CRAWFORD, DENT, GASCONADE, HOWARD, MARIES, MILLER, MONITEAU, OSAGE, PHELPS AND RANDOLPH COUNTIES:

Electricians	18.68	4.95+13%
Cable Splicers	18.93	4.95+13%

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 ELEC0350B 12/01/1998

	Rates	Fringes
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ADAIR, AUDRAIN (East of Highway 19), CLARK, KNOX, LEWIS, LINN, MACON, MARION, MONROE, MONTGOMERY, PIKE, PUTNAM, RALLS, SCHUYLER, SCOTLAND, SHELBY AND SULLIVAN COUNTIES

ELECTRICIANS	22.39	7.09
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 ELEC0453D 09/01/1997

	Rates	Fringes
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CHRISTIAN, DALLAS, DOUGLAS, GREENE, HICKORY, OREGON, OZARK, SHANNON, TEXAS, WEBSTER AND WRIGHT COUNTIES

ELECTRICIANS	18.00	4.22+9%
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PULASKI COUNTY

ELECTRICIANS	19.04	4.22+9%
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HOWELL, LACLEDE, POLK, STONE AND TANEY COUNTIES

ELECTRICIANS	13.75	3.82+6%
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 ELEC0545D 06/01/1998

	Rates	Fringes
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ANDREW, BUCHANAN, CLINTON, DEKALB, ATCHISON, HOLT, MERCER,

GENTRY, HARRISON, DAVIESS, GRUNDY, WORTH, LIVINGSTON, NODAWAY,  
AND CALDWELL COUNTIES

ELECTRICIANS 21.72 2.35+19.5%

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ELEC0702D 09/04/1995

Rates Fringes  
BOLLINGER, BUTLER, CAPE GIRARDEAU, DUNKLIN, MADISON, MISSISSIPPI,  
NEW MADRID, PEMISCOT, SCOTT, STODDARD AND WAYNE COUNTIES

LINE CONSTRUCTION:

Lineman	25.50	17%+2.00
Groundman Equipment Operator (all crawler type equipment D-4 and larger)	21.87	17%+2.00
Groundman - Class A	15.45	17%+2.00

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ENGI0016A 05/01/1999

Rates Fringes  
BARRY, BARTON, CAMDEN, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS,  
GREENE, JASPER, LAWRENCE, HICKORY, LACLEDE, MCDONALD, NEWTON,  
OZARK, POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER AND  
WRIGHT COUNTIES

POWER EQUIPMENT OPERATORS

GROUP 1	19.32	4.95
GROUP 2	18.97	4.95
GROUP 3	18.77	4.95
GROUP 4	16.72	4.95

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt finishing machine & trench widening spreader;  
asphalt plant console operator; autograder; automatic slipform  
paver; backhoe; blade operator - all types; boat operator -  
tow; boilers-2; central mix concrete plant operator; clamshell  
operator; concrete mixer paver; crane operator; derrick or  
derrick trucks; ditching machine; dozer operator; dragline  
operator; dredge booster pump; dredge engineman; dredge operator;  
drill cat with compressor mounted on cat; drilling or boring  
machine rotary self-propelled; highloader; hoisting engine - 2  
active drums; launch hammer wheel; locomotive operator; -  
standard guage; mechanic and welders; mucking machine; off-road  
trucks; piledriver operator; pitman crane operator; push cat  
operator; quad trac; scoop operator - all types; shovel operator;  
sideboom cats; skimmer scoop operators; trenching machine  
operator; truck crane.

GROUP 2: A-frame; asphalt hot-mix silo; asphalt plant fireman  
(drum or boiler); asphalt plant man; asphalt plant man; asphalt  
plant mixer operator; asphalt roller operator; backfiller  
operator; barber-greene loader; boat operator (bridges and dams);  
chip spreader; concrete mixer operator - skip loader; concrete  
plant operator; concrete pump operator; crusher operator; dredge  
oiler; elevating grader operator; fork lift; greaser-fleet;  
hoisting engine - 1; locomotive operator - narrow gauge; multiple  
compactor; pavement breaker; powerbroom - self-propelled; power  
shield; rooter; side discharge concrete spreader; slip form  
finishing machine; stumpcutter machine; throttle man; tractor  
operator (over 50 h.p.); winch truck.

GROUP 3: Boilers - 1; chip spreader (front man); churn drill  
operator; clef plane operator; concrete saw operator (self-  
propelled); curb finishing machine; distributor operator;

finishing machine operator; flex plane operator; float operator; form grader operator; pugmill operator; roller operator, other than high type asphalt; screening & washing plant operator; siphons & jets; sub-grading machine operator; spreader box operator, self-propelled (not asphalt); tank car heater operator (combination boiler & booster); tractor operator (50 h.p. or less); Ulmac, Ulric or similar spreader; vibrating machine operator, not hand;

GROUP 4: Grade checker; Oiler; Oiler-Driver

HOURLY PREMIUMS:

The following classifications shall receive \$ .25 above GROUP 1 rate: Clamshells - 3 yds. or over; Cranes - Rigs or Piledrivers, 100 ft. of boom or over (including jib); Draglines - 3 yds. or over; Hoists - each additional active drum over 2 drums; Shovels - 3 yds. or over;

The following classifications shall receive \$ .50 above GROUP 1 rate: Tandem scoop operator; Cranes - Rigs or Piledrivers, 150 ft. to 200 ft. of boom (including jib); Tandem scoop.

The following classifications shall receive \$ .75 above GROUP 1 rate: Cranes - Rigs or Piledrivers, 200 ft. of boom or over (including jib.).

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ENGI0101A 05/01/1998

BUCHANAN, CASS (Except that part of the geographic boundaries of the Richard-Gebaur Air Force Base), CLINTON AND LAFAYETTE COUNTIES

POWER EQUIPMENT OPERATORS

	Rates	Fringes
GROUP 1	19.55	6.55
GROUP 2	19.15	6.55
GROUP 3	17.15	6.55

ANDREW, ATCHISON, BATES, BENTON, CALDWELL, CARROLL, CHARITON, COOPER, DAVIESS, DEKALB, GENTRY, GRUNDY, HARRISON, HENRY, HOLT, HOWARD, JOHNSON, LINN, LIVINGSTON, MERCER, NODAWAY, PETTIS, SALINE, SULLIVAN AND WORTH COUNTIES

POWER EQUIPMENT OPERATORS

GROUP 1	19.55	6.55
GROUP 2	19.15	6.55
GROUP 3	17.15	6.55

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt roller operator, finish; asphalt paver and spreader; asphalt plant operator; auto grader or trimmer or sub-grader; backhoe; blade operator (all types); boilers - 2; booster pump on dredge; bulldozer operator; boring machine (truck or crane mounted); clamshell operator; concrete mixer paver; concrete plant operator; concrete pump operator; crane operator; derrick or derrick trucks; ditching machine; dragline operator; dredge engineman; dredge operator; drill cat with compressor mounted (self-contained) or similar type self-propelled rotary drill (not air tract); drilling or boring machine (rotary-self-propelled); finishing machine operator; greaser; high loader-fork lift-skid loader (all types); hoisting engineer (2 active drums); locomotive operator (standard guage); mechanics and welders (field and plants); mucking machine operator; pile drive operator; pitman crane or boom truck (all types); push cat; quad track; scraper operators (all types); shovel operator; sideboom cats; side discharge

spreader; skimmer scoop operators; slip form paver operator (CMI, Rex, Gomeco or equal); la tourneau roter (all tiller types); tow boat operator; truck crane; wood and log chippers (all types).

GROUP 2: A-frame truck operator; articulated dump truck; back filler operator; boilers (1); chip spreader; churn drill operator; compressor; concrete mixer operator, skip loader; concrete saws (self-propelled); conveyor operator; crusher operator; distributor operator; elevating grader operator; farm tractor (all attachments); fireman rig; float operator; form grade operator; hoisting engine (one drum); maintenance operator; multiple compactor; pavement breaker, self-propelled hydra-hammer (or similar type); paymill operator; power shield; pumps; roller operator (with or without blades); screening and washing plant; self-propelled street broom or sweeper; siphons and jets; straw blower; stump cutting machine; siphons and jets; tank car heater operator (combination boiler and booster); welding machine; vibrating machine operator (not hand held); welding machine.

GROUP 3: Oiler; oiler driver; mechanic.

HOURLY PREMIUMS:

THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$ .25) ABOVE GROUP 1 RATE: Dragline operator - 3 yds. & over; shovel 3 yds. & over; clamshell 3 yds. & over; Crane, rigs or piledrivers, 100' of boom or over (incl. jib.), hoist - each additional active drum over 2 drums

THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$ .50) ABOVE GROUP 1 RATE: Tandem scoop operator; crane, rigs or piledrivers 150' to 200' of boom (incl. jib.)

THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$ .75) ABOVE GROUP 1 RATE: Crane rigs, or piledrivers 200 ft. of boom or over (including jib.)

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ENGI0101E 04/01/1999

CASS (Richards-Gebaur Air Force Base ONLY), CLAY, JACKSON, PLATTE AND RAY COUNTIES

POWER EQUIPMENT OPERATORS:

	Rates	Fringes
GROUP 1	21.44	7.22
GROUP 2	20.40	7.22
GROUP 3	15.93	7.22
GROUP 4	19.28	7.22

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt roller operator, finish; asphalt paver and spreader; asphalt plant operator; auto grader or trimmer or sub-grader; backhoe; blade operator (all types); boilers-2; booster pump on dredge; boring machine (truck or crane mounted); bulldozer operator; clamshell operator; concrete cleaning decontamination machine operator; concrete mixer paver; concrete plant operator; concrete pump operator; crane operator; derrick or derrick trucks; ditching machine; dragline operator; dredge engineman; dredge operator; drillcat with compressor mounted (self-contained) or similar type self propelled rotary drill (not air tract); drilling or boring machine (rotary - self-propelled); finishing machine operator; greaser; heavy equipment robotics operator/mechanic; horizontal directional drill operator; horizontal directional drill locator; loader-forklift - skid loader (all types); hoisting engineer (2 active drums); locomotive operator (standard gauge);

master environmental maintenance mechanic; mechanics and welders (field and plants); mucking machine operator; piledrive operator; pitman crane or boom truck (all types); push cat; quad-track; scraper operators (all types); shovel operator; side discharge spreader; sideboom cats; skimmer scoop operator; slip-form paver (CMI, REX, Gomaco or equal); la tourneau rooter (all tiller types); tow boat operator; truck crane; ultra high perssure waterjet cutting tool system operator/mechanic; vacuum blasting machine operator/mechanic; wood and log chippers (all types)

GROUP 2: "A" Frame truck operator; articulated dump truck; back filler operator; boilers (1); chip spreader; churn drill operator; concrete mixer operator, skip loader; concrete saws (self-propelled); conveyor operator; crusher operator; distributor operator; elevating grader operator; farm tractor (all attachments); fireman rig; float operator; form grader operator; hoisting engine (1 drum); maintenance operator; multiple compactor; pavement breaker, self-propelled hydra-hammer (or similar type); power shield; paymill operator; pumps; siphons and jets; stump cutting machine; tank car heater operator (combination boiler and booster); compressor; roller operator (with or without blades); screening and washing plant; self-propelled street broom or sweeper; straw blower; tank car heater operator (combination boiler and booster); vibrating machine operator (not hand held)

GROUP 3: Oilers

GROUP 4: Oiler Driver (All Types)

FOOTNOTE:

HOURLY PREMIUMS

FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$.25) ABOVE GROUP 1 RATE: Clamshells - 3 yd. capacity or over; Cranes or rigs, 80 ft. of boom or over (including jib); Draglines, 3 yd. capacity or over; Piledrivers 80 ft. of boom or over (including jib); Shovels & backhoes, 3 yd. capacity or over.

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 \* ENGI0513D 05/01/1999

	Rates	Fringes
FRANKLIN, JEFFERSON, LINCOLN, ST CHARLES, AND WARREN COUNTIES		
POWER EQUIPMENT OPERATORS:		

GROUP 1	23.37	9.94
GROUP 2	22.07	9.94
GROUP 3	19.07	9.94
GROUP 4	21.62	9.94

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Backhoe, Cable; Backhoe, Hydraulic (2 cu yds bucket and under regardless of attachment, one oiler for 2 or 3, two oiler for 4 through 6); Backhoe, Hydraulic over 2 cu yds; Cableway; Crane, Crawler or Truck; Crane, Hydraulic - Truck or Cruiser mounted, 16 tons and over; Crane, Locomotive; crane with boom including jib over 100 ft from pin to pin; Crane using rock socket tool; Derrick, Steam; Derrick Car and Derrick Boat; Dragline, 7 cu yds and over; Dredge; Gradall, Crawler or tire mounted; Locomotive, Gas, Steam & other powers; Pile Driver, Land or Floating; Scoop, Skimmer; Shovel, Power (Electric, Gas, Steam or other powers); Shovel, Power (7 cu yds and over); Switch Boat; Whirley; Air Tugger with air compressor; Anchor Placing Barge; Asphalt Spreaker; Athey Force Feeder Loader, self-propelled;

Backfilling Machine; Boat Operator - Push Boat or Tow Boat (job site); Boiler, High Pressure Breaking in Period; Boom Truck, Placing or Erecting; Boring Machine, Footing Foundation; Bullfloat; Cherry Picker; Combination Concrete Hoist and Mixer (such as Mixermobile); Compressor, Two 125 CFM and under; Compressor, Two through Four over 125 CFM; Compressor when operator runs throttle; Concrete Breaker (Truck or Tractor mounted); Concrete Pump (such as Pumpcrete machine); Concrete Saw (self-propelled); Concrete Spreader; Conveyor, Large (not self-propelled) hoisting or moving brick and concrete into, or into and on floor level, one or both; Crane, Climbing (such as Linden); Crane, Hydraulic - Rough Terrain, self-propelled; Crane, Hydraulic - Truck or Cruiser mounted - under 16 tons; Drilling machine - Self-powered, used for earth or rock drilling or boring (wagon drills and any hand drills obtaining power from other sources including concrete breakers, jackhammers and Barco equipment no engineer required); Elevating Grader; Engine Man, Dredge; Excavator or Powerbelt Machine; Finishing Machine, self-propelled oscillating screed; Forklift; Generators, Two through Six 30 KW or over; Grader, Road with power blade; Greaser; Highlift; Hoist, Concrete and Brick (Brick cages or concrete skips operating or on tower, Towermobile, or similar equipment); Hoist, Three or more drums in use; Hoist, Stack; Hydro-Hammer; Lad-A-Vator, hoisting brick or concrete; Loading Machine such as Barber-Greene; Mechanic on job site

GROUP 2: Air Tugger with plant air; Boiler (for power or heating shell of building or temporary enclosures in connection with construction work); Boiler, Temporary; Compressor, One over 125 CFM; Compressor, truck mounted; Conveyor, Large (not self-propelled); Conveyor, Large (not self-propelled) moving brick and concrete (distributing) on floor level; Curb Finishing Machine; Ditch Paving Machine; Elevator (outside); Endless Chain Hoist; Fireman (as required); Form Grader; Hoist, One Drum regardless of size (except brick or concrete); Lad-A-Vator, other hoisting; Manlift; Mixer, Asphalt, over 8 cu ft capacity; Mixer, one bag capacity or less; Mixer, without side loader, two bag capacity or more; Mixer, with side loader, regardless of size, not Paver; Mud Jack (where mud jack is used in conjunction with an air compressor, operator shall be paid \$ .55 per hour in addition to his basic hourly rate for covering both operations); Pug Mill operator; Pump, Sump - self powered, automatic controlled over 2"; Scissor Lift (used for hoisting); Skid Steer Loader; Sweeper, Street; Tractor, small wheel type 50 HP and under with grader blade and similar equipment; Welding Machine, One over 400 amp; Winch, operating from truck

GROUP 3: Boat operator - outboard motor, job site; Conveyors (such as Con-Vay-It) regardless of how used; Elevator (inside); Heater operator, 2 through 6; Sweeper, Floor

GROUP 4: Crane type

#### HOURLY PREMIUMS:

Backhoe, Hydraulic 2 cu yds or less without oiler - \$2.00; Crane, climbing (such as Linden) - \$ .50; Crane, Pile Driving and Extracting - \$ .50; Crane with boom (including job) over 100 ft from pin to pin - \$ .50 (add \$ .01 per foot to maximum of \$2.00); Crane, using rock socket tool - \$ .50; Derrick, diesel, gas or electric hoisting material and erecting steel (150 ft or more above ground) - \$ .50; Dragline, 7 cu yds and over - \$ .50;

Hoist, Three or more drums in use - \$ .50; Scoop, Tandem - \$ .50; Shovel, Power - 7 cu yds and over - \$ .50; Tractor, Tandem Crawler - \$ .50; Tunnel, man assigned to work in tunnel or tunnel shaft - \$ .50; Wrecking, when machines are working on second floor or higher - \$ .50

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 \* ENGI0513G 05/01/1999

	Rates	Fringes
ADAIR, AUDRAIN, BOLLINGER, BOONE, BUTLER, CALLAWAY, CAPE		
GIRARDEAU, CARTER, CLARK, COLE, CRAWFORD, DENT, DUNKLIN,		
GASCONADE, HOWELL, IRON, KNOX, LEWIS, MACON, MADISON, MARIES,		
MARION, MILLER, MISSISSIPPI, MONITEAU, MONROE, MONTGOMERY,		
MORGAN, NEW MADRID, OREGON, OSAGE, PEMISCOT, PERRY, PHELPS, PIKE,		
PULASKI, PUTNAM, RALLS, RANDOLPH, REYNOLDS, RIPLEY, ST. FRANCOIS,		
STE. GENEVIEVE, SCHUYLER, SCOTLAND, SCOTT, SHANNON, SHELBY,		
STODDARD, TEXAS, WASHINGTON, AND WAYNE COUNTIES		
POWER EQUIPMENT OPERATORS		
GROUP 1	19.80	9.92
GROUP 2	19.45	9.92
GROUP 3	19.25	9.92
GROUP 4	15.60	9.92

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt finishing machine & trench widening spreader, asphalt plant console operator; autograder; automatic slipform paver; back hoe; blade operator - all types; boat operator tow; boiler two; central mix concrete plant operator; clam shell operator; concrete mixer paver; crane operator; derrick or derrick trucks; ditching machine; dozer operator; dragline operator; dredge booster pump; dredge engineman; dredge operator; drill cat with compressor mounted on cat; drilling or boring machine rotary self-propelled; highloader; hoisting engine 2 active drums; launchhammer wheel; locomotive operator standrad guage; mechanics and welders; mucking machine; piledriver operator; pitman crane operator; push cat operator; quad-trac; scoop operator; sideboom cats; skimmer scoop operator; trenching machine operator; truck crane, shovel operator.

GROUP 2: A-Frame; asphalt hot-mix silo; asphalt roller operator asphalt plant fireman (drum or boiler); asphalt plant man; asphalt plant mixer operator; backfiller operator; barber-greene loader; boat operator (bridge & dams); chip spreader; concrete mixer operator skip loader; concrete plant operator; concrete pump operator; dredge oiler; elevating graded operator; fork lift; grease fleet; hoisting engine one; locomotive operator narrow guage; multiple compactor; pavement breaker; powerbroom self-propelled; power shield; rooter; slip-form finishing machine; stumpcutter machine; side discharge concrete spreader; throttleman; tractor operator (over 50 hp); winch truck; asphalt roller operator; crusher operator.

GROUP 3: Spreader box operator, self-propelled not asphalt; tractor operator (50 h.p. or less); boilers one; chip spreader (front man); churn drill operator; compressor over 105 CFM 2-3 pumps 4" & over; 2-3 light plant 7.5 KWA or any combination thereof; clef plane operator; compressor maintenance operator 2 or 3; concrete saw operator (self-propelled); curb finishing mancine; distributor operator; finishing machine operator; flex plane operator; float operator; form grader operator; pugmill operator; riller operator other than high type asphalt; screening

& washing plant operator; siphons & jets; subgrading machine operator; tank car heater (combination boiler & booster); ulmac, ulric or similar spreader; vibrating machine operator; hydrobroom.

GROUP 4: Oiler; grout machine; oiler driver; compressor over 105 CFM one; conveyor operator one; maintenance operator; pump 4" & over one.

FOOTNOTE:

HOURLY PREMIUMS

FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$.25) ABOVE GROUP 1 RATE: Crane with 3 yds. & over buckets; dragline operator 3 yds. & over; shovel 3 yds. & over; piledrivers all types; clamshell 3 yds. & over; hoists each additional active drum over 2 drums; FOLLOWING CLASSIFICATION SHALL RECEIVE (\$.50) ABOVE GROUP 1 RATE: Tandem scoop operator, crane, rigs over 100 feet (incl. jib) .01 per foot.

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 \* ENGI0513H 05/01/1999

	Rates	Fringes
ST. LOUIS CITY AND COUNTY		
POWER EQUIPMENT OPERATORS:		
GROUP 1	23.37	9.94
GROUP 2	23.37	9.94
GROUP 3	21.47	9.94
GROUP 4	18.47	9.94
GROUP 5	18.01	9.94

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Backhoe, cable or hydraulic; cableway; crane, crawler or truck; crane, hydraulic-truck or cruiser mounted 16 tons & over; crane locomotive; derrick, steam; derrick car & derrick boat; dragline; dredge; gradall, crawler or tire mounted; locomotive, gas, steam & other powers; pile driver, land or floating; scoop, skimmer; shovel, power (steam, gas, electric, or other powers); switch boat; whirley.

GROUP 2: Air tugger w/air compressor; anchor-placing barge; asphalt spreader; athey force feeder loader (self-propelled); backfilling machine; backhoe-loader; boat operator-push boat or tow boat (job site); boiler, high pressure breaking in period; boom truck, placing or erecting; boring machine, footing foundation; bull-float; cherry picker; combination concrete hoist & mixer (such as mixer mobile); compressor (when operator runs throttle); concrete breaker (truck or tractor mounted); concrete pump, such as pump-crete machine; concrete saw (self-propelled), concrete spreader; conveyor, large (not self-propelled), hoisting or moving brick and concrete into, or into and on floor level, one or both; crane, hydraulic-rough terrain, self-propelled; crane hydraulic-truck or cruiser mounted-under 16 tons; drilling machines, self-powered use for earth or rock drilling or boring (wagon drills and any hand drills obtaining power from other sources including concrete breakers, jackhammers and barco equipment-no engineer required); elevating grader; engineman, dredge; excavator or powerbelt machine; finishing machine, self-propelled oscillating screed;

forklift; grader, road with power blade; highlift; greaser; hoist, stack, hydro-hammer; loading machine (such as barber-greene); machanic, on job site; mixer, pipe wrapping machines; plant asphalt; plant, concrete producing or ready-mix job site; plant heating-job site; plant mixing-job site; plant power, generating-job site; pumps, two through six self-powered over 2"; pumps, electric submersible, two through six, over 4"; quad-track; roller, asphalt, top or sub-grade; scoop, tractor drawn; spreader box; sub-grader; tie tamper; tractor-crawler, or wheel type with or without power unit, power take-offs and attachments regardless of size; trenching machine; tunnel boring machine; vibrating machine automatic, automatic propelled; welding machines (gasoline or diesel) two through six; well drilling machine

GROUP 3: Conveyor, large (not self-propelled); conveyor, large (not self-propelled) moving brick and concrete (distributing) on floor level; mixer two or more mixers of one bag capacity or less; air tugger w/plant air; boiler, for power or heating on construction projects; boiler, temporary; compressor (mounted on truck; curb finishing machine; ditch paving machine; elevator; endless chain hoist; form grader; hoist, one drum regardless of size; lad-a-vator; manlift; mixer, asphalt, over 8 cu. ft. capacity, without side loader, 2 bag capacity or more; mixer, with side loader, regardless of size; pug mill operator; pump, sump-self-powered, automatic controlled over 2" during use in connection with construction work; sweeper, street; welding machine, one over 400 amp.; winch operating from truck; scissor lift (used for hoisting); tractor, small wheel type 50 h.p. & under with grader blade & similar equipment

GROUP 4: Boat operator-outboard motor (job site); conveyor (such as con-vay-it) regardless of how used; sweeper, floor

GROUP 5: Oiler on dredge and on truck crane; crane with boom (including jib), over 100' from pin to pin (add 1 cent per foot to maximum of \$2.00) above basic rate for crane work in tunnel or tunnel shaft, \$ 0.50 above base rate; mud jack where mud jack is used in conjunction with an air compressor operator fifty-five cent per hour additional to his basic rate for covering both operations)

HOURLY PREMIUMS:

Backhoe, hydraulic	
2 cu. yds. or under without oiler	\$2.00
Crane, climbing (such as Linden)	.50
Crane, pile driving and extracting	.50
Crane, with boom (including jib) over 100' (from pin to pin) add \$.01 per foot to maximum of	4.00
Crane, using rock socket tool	.50
Derrick, diesel, gas or electric, hoisting material and erecting steel (150' or more above ground)	.50
Dragline, 7 cu. yds. and over	.50
Hoist, three (3) or more drums in use	.50

Scoop, Tandem	.50
Shovel, power - 7 cu. yds. or more	.50
Tractor, tandem crawler	.50
Tunnel, man assigned to work in tunnel or tunnel shaft	.50
Wrecking, when machine is working on second floor or higher	.50

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IRON0010M 04/01/1999

	Rates	Fringes
BUCHANAN, CASS, CLAY, JACKSON, JOHNSON, LAFAYETTE, PLATTE AND RAY Counties		
IRONWORKERS	21.05	9.78
ANDREW, ATCHISON, BARTON, BATES, BENTON, CALDWELL, CAMDEN, CARROLL, CEDER CHARITON, CHRISTIAN, CLINTON, COOPER, DADE, DALLAS, DAVIESS, DE KALB, GENTRY, GREENE, GRUNDY, HARRISON, HENRY, HICKORY, HOLT, HOWARD, LACLEDE, LINN, LIVINGSTON, MERCER, MONITEAU, MORGAN, NODAWAY, PETTIS, POLK, PUTNAM, RANDOLPH, ST. CLAIR, SALINE, SULLIVAN, VERNON, WEBSTER, WRIGHT and WORTH Counties; and portions of ADAIR, BOONE, MACON, MILLER, and RANDOLPH Counties		
IRONWORKERS	18.05	9.78

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IRON0321C 12/31/1998

	Rates	Fringes
DOUGLAS, HOWELL, OZARK AND TANEY COUNTIES		
IRONWORKERS	15.00	6.41

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IRON0396D 10/07/1998

	Rates	Fringes
ST. LOUIS (City and County), ST. CHARLES, JEFFERSON, IRON, FRANKLIN, LINCOLN, WARREN, WASHINGTON, ST. FRANCOIS, STE. GENEVIEVE, and REYNOLDS Counties; and portions of MADISON, PERRY, BOLLINGER, WAYNE, and CARTER Counties		
IRONWORKERS	22.61	9.90

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IRON0396I 10/07/1998

	Rates	Fringes
AUDRAIN, CALLAWAY, COLE, CRAWFORD, DENT, GASCONADE, MARIES, MONTGOMERY, OSAGE, PHELPS, PIKE, PULASKI, TEXAS, and WRIGHT Counties; and portions of CAMDEN, DOUGLAS, HOWELL, MILLER, OREGON, BOONE, SHANNON, LACLEDE, MONROE, and RALLS Counties		
IRONWORKERS	17.72	9.87

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\* IRON0577F 06/01/1999

	Rates	Fringes
ADAIR, CLARK, KNOX, LEWIS, MACON, MARION, MONROE, RALLS, SCHUYLER, SCOTLAND, AND SHELBY COUNTIES		
IRONWORKERS	18.20	8.46

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IRON0584E 06/01/1998

	Rates	Fringes
BARRY, JASPER, LAWRENCE, MCDONALD, NEWTON AND STONE Counties		
IRONWORKERS	16.30	6.87

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IRON0782D 05/01/1998

	Rates	Fringes
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CAPE GIRARDEAU, MISSISSIPPI, NEW MADRID, SCOTT, & STODDARD  
 Counties; and portions of BOLLINGER, BUTLER, CARTER, DUNKLIN,  
 MADISON, PEMISCOT, PERRY, RIPLEY, and WAYNE Counties

IRONWORKERS:

All Major River Work (Dams, Bridges): Projects \$20 million or more	19.40	8.81
All Other Work: Projects \$1.5 million or more	17.55	7.77
Projects less than \$1.5 million	16.67	7.77

\* LABO0042C 03/01/1999

	Rates	Fringes
ST. LOUIS (City and County)		
LABORERS:		
Plumber Laborers	21.65	6.00

LABO0042H 03/03/1999

	Rates	Fringes
ST. LOUIS (City and County)		
LABORERS:		
Laborers, Flagperson	21.51	6.00
Wrecking	21.39	6.00
Dynamiter, Powderman	22.01	6.00

LABO0424B 05/01/1998

	Rates	Fringes
FRANKLIN COUNTY		
LABORERS		
GROUP 1	19.75	5.30
GROUP 2	20.35	5.30
JEFFERSON COUNTY		
LABORERS		
GROUP 1	19.80	5.30
GROUP 2	20.40	5.30
ADAIR, AUDRAIN, BOLLINGER, BOONE, BUTLER, CALLAWAY, CAPE GIRARDEAU, CARTER, CHARITON, CLARK, COLE, COOPER, CRAWFORD, DENT, DUNKLIN, GASCONADE, HOWARD, HOWELL, IRON, KNOX, LEWIS, LINN, MACON, MADISON, MARIES, MARION, MILLER, MISSISSIPPI, MONITEAU, MONROE, NEW MADRID, OREGON, OSAGE, PEMISCOT, PERRY, PHELPS, PIKE, PULASKI, PUTNAM, RALLS, RANDOLPH, REYNOLDS, RIPLEY, ST. FRANCOIS, STE. GENEVIEVE, SCHUYLER, SCOTLAND, SCOTT, SHANNON, SHELBY, STODDARD, SULLIVAN, TEXAS, WASHINGTON, AND WAYNE COUNTIES		
LABORERS		
GROUP 1	18.30	5.30
GROUP 2	18.90	5.30
LINCOLN, MONTGOMERY AND WARREN COUNTIES		
LABORERS		
GROUP 1	18.55	5.30
GROUP 2	19.15	5.30

LABORERS CLASSIFICATIONS

GROUP 1 - General laborer-flagman, carpenter tenders; salamander  
 Tenders; Dump Man; Ticket Takers; loading trucks under bins,  
 hoppers, and conveyors; track man; cement handler; dump man on  
 earth fill; georgie buggy man; material batch hopper man;  
 spreader on asphalt machine; material mixer man (except on

manholes); coffer dams; riprap pavers rock, block or brick; scaffolds over ten feet not self-supported from ground up; skip man on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoling, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with hydraulic or general dredging operations; form setters, puddlers (paving only); straw blower nozzle man; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizers, board and willow mat weavers and cable ties on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 ft. where compressed air is not used; abutment and pier hole men working six (6) ft. or more below ground; men working in coffer dams for bridge piers and footing in the river; barco tamper; jackson or any other similar tamp; cutting torch man; liners, curb, gutters, ditch lines; hot mastic kettlemen; hot tar applicator; hand blade operator; mortar men or brick or block manholes; rubbing concrete, air tool operator under 65 lbs.; caulker and lead man; chain or concrete saw under 15 h.p.; signal Gan; Guard rail and sign erectors. GROUP 2 - Skilled laborers - Vibrator man; asphalt raker; head pipe layer on sewer work; batterboard man on pipe and ditch work; cliff scalers working from bosun's chairs; scaffolds or platforms on dams or power plants over 10 ft. high; air tool operator over 65 lbs.; stringline man on concrete paving; sandblast man; laser beam man; wagon drill; churn drill; air track drill and all other similar type drills, gunite nozzle man; pressure grout man; screed man on asphalt; concrete saw 15 h.p. and over; grade checker; strigline man on electronic grade control; manhole builder; dynamite man; powder man; welder; tunnel man; waterblaster - 1000 psi or over; asbestos and/or hazardous waste removal and/or disposal

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 \* LABO0579F 05/01/1999

	Rates	Fringes
BUCHANAN, CASS AND LAFAYETTE COUNTIES		
LABORERS		
GROUP 1	16.88	5.75
GROUP 2	17.23	5.75
ANDREW, ATCHISON, BARRY, BARTON, BATES, BENTON, CALDWELL, CAMDEN, CARROLL, CEDAR, CHRISTIAN, CLINTON, DADE, DALLAS, DAVIESS, DEKALB, DOUGLAS, GREENE, GENTRY, GRUNDY, HARRISON, HENRY, HICKORY, HOLT, JASPER, JOHNSON, LACLEDE, LAWRENCE, LIVINGSTON, MCDONALD, MERCER, MORGAN, NEWTON, NODAWAY, OZARK, PETTIS, POLK, ST. CLAIR, SALINE, STONE, TANEY, VERNON, WEBSTER, WORTH AND WRIGHT COUNTIES.		
LABORERS		
GROUP 1	15.63	5.50
GROUP 2	16.18	5.50

LABORERS CLASSIFICATIONS

GROUP 1: General Laborers - Carpenter tenders; salamander tenders; loading trucks under bins; hoppers & conveyors; track men & all other general laborers; air tool operator; cement handler-bulk or sack; dump man on earth fill; georgie buggy man; material batch hopper man; material mixer man (except on

manholes); coffer dams; riprap pavers - rock, block or brick; signal man; scaffolds over ten feet not self-supported from ground up; skipman on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoline, oil drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator, all work in connection with hydraulic or general dredging operations; puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material or materials (where special protection is required); rubbing concrete; topper of standing trees; batter board man on pipe and ditch work; feeder man on wood pulverizers; board and willow mat weavers and cable tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 feet where compressed air is not used; abutment and pier hole men working six (6) feet or more below ground; men working in coffer dams for bridge piers and footings in the river; ditchliners; pressure groutmen; caulker; chain or concrete saw; cliffscalers working from scaffolds, bosuns' chairs or platforms on dams or power plants over (10) feet above ground; mortarmen on brick or block manholes; toxic and hazardous waste work.

GROUP 2: Skilled Laborers - Head pipe layer on sewer work; lase beam man; Jackson or any other similar tamp; cutting torch man; form setters; liners and stringline men on concrete paving, curb, gutters; hot mastic kettleman; hot tar applicator; sandblasting and gunite nozzlelemen; air tool operator in tunnels; screed man on asphalt machine; asphalt raker; barco tamper; churn drills; air track drills and all similar drills; vibrator man; stringline man for electronic grade control; manhole builders-brick or block; dynamite and powder men; grade checker.

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 \* LAB00660H 03/01/1999

	Rates	Fringes
ST. CHARLES COUNTY		
LABORERS:		
GROUP 1	20.72	5.59
GROUP 2	20.72	5.59

LABORERS CLASSIFICATIONS

GROUP 1: General laborer; carpenter tender; salamander tender; dump man; ticket takers; flagman; loading trucks under bins, hoppers, and conveyors; track men; cement handler; dump man on earth fill; Georgie buggy man; material batch hopper man; spreader on asphalt machine; material mixer man (except on manholes); coffer dams; riprap paver - rock, block, or brick; signal man; scaffolds over 10 ft not self-supported from ground up; skipman on concrete paving; wire mech setters on concrete paving; all work in connection with sewer, water, gas, gasoline, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with hydraulic or general dredging operations; form setters; puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizer; board and willow mat weavers and cable



in the river, ditchliners, pressure groutmen, caulker and chain or concrete saw, cliffscalers working from scaffolds, bosuns' chairs or platforms on dams or power plants over (10) feet above ground, mortarmen on brick or block manholes, signal man.  
 GROUP 2: Skilled Laborer - spreader or screed man on asphalt machine, asphalt raker, grade checker, vibrator man, concrete saw over 5 hp., laser beam man, barco tamper, jackson or any other similar tamp, wagon driller, churn drills, air track drills and other similar drills, cutting torch man, form setters, liners and stringline men on concrete paving, curb, gutters and etc., hot mastic kettleman, hot tar applicator, hand blade operators, mortar men on brick or block manholes, sand blasting and gunnite nozzle men, rubbing concrete, air tool operator in tunnels, head pipe layer on sewer work, manhole builder (brick or block), dynamite and powder men.

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 PAIN0002B 09/01/1996

	Rates	Fringes
CLARK, FRANKLIN, JEFFERSON, LEWIS, LINCOLN, MARION, PIKE, RALLS, ST. CHARLES, ST. LOUIS (CITY & COUNTY), AND WARREN COUNTIES		
PAINTERS:		
Brush	19.60	6.66
Spray	21.60	6.66

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 PAIN0003D 04/01/1997

	Rates	Fringes
BATES, BENTON, CALDWELL, CARROLL, CASS, CLAY, CLINTON, COOPER, DAVIESS, GRUNDY, HARRISON, HENRY, JACKSON, JOHNSON, LAFAYETTE, LIVINGSTON, MERCER, MONITEAU, MORGAN, PETTIS, PLATTE, RAY AND SALINE COUNTIES		
PAINTERS:		
Brush & Roller; Taper;		
Bazooka; Lead Abatement	19.90	4.15
Paperhanger	20.40	4.15
Storage Bin & Tanks (Roller or Brush); Elevated Tanks (Roller or Brush); Stageman; Beltman; Bridgeman; Steelman; Sand Blast (Base); Elevator Shaft	20.65	4.15
Sprayman	20.90	4.15
Sandblast (Bridge, Stage, Erected Steel and Storage Bin and Tanks)	21.40	4.15
Sprayman (Storage Bin & Tanks, Elevated Tanks); Stageman (Spray); Bridgeman (Spray); Steelman (Spray)	21.65	4.15
Steeplejack (other than Elevated Tanks)	24.59	4.15
Steeplejack -Spray or Sandblast (other than Elevated Tanks)	25.59	4.15

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 PAIN0098B 05/01/1999

	Rates	Fringes
ANDREW, ATCHISON, BUCHANAN, DE KALB, GENTRY, HOLT, NODAWAY & WORTH COUNTIES		
PAINTERS:		
Brush & Roller	19.50	4.40

Sandblasters	20.50	4.40
Steeple Jack	22.50	4.40

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PAIN0203B 04/01/1999

	Rates	Fringes
BARRY, BARTON, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY, HOWELL, JASPER, LAWRENCE, MCDONALD, NEWTON, OZARK, POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER and WRIGHT COUNTIES		
PAINTERS:		
Sandblasters & Highman (over 40')	17.68	3.23
Painters	17.38	3.23
Tapers	16.47	3.21

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PAIN1185C 04/16/1997

	Rates	Fringes
ADAIR, AUDRAIN, BOONE, CALLAWAY, CHARITON, COLE, GASCONADE, HOWARD, KNOX, LINN, MACON, MONROE, MONTGOMERY, OSAGE, PUTNAM, RANDOLPH, SCHUYLER, SCOTLAND, SHELBY AND SULLIVAN COUNTIES and the City of Booneville.		
PAINTERS:		
Brush, Roller, Paperhanger, Taper, Structural Steel; Epoxy (Water Base ONLY); Steam Removal of Wallpaper	16.25	1.00
Structural Steel Brush or Roller; Epoxy Brush or Roller; Epoxy Structural Steel	16.75	1.00
Spray, Structural Steel (Over 50' high); Sandblasting; Epoxy Spray	17.25	1.00
Structural Steel Brush or Roller (50' high); Stage Brush or Roller	18.25	1.00
Epoxy Structural Steel (50' high); Epoxy Stage Structural Steel	18.75	1.00

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PAIN1265C 07/01/1998

	Rates	Fringes
CAMDEN, CRAWFORD, DENT, LACLEDE, MARIES, MILLER, PHELPS, PULASKI AND TEXAS COUNTIES		
PAINTERS:		
Brush and Roller	15.90	6.44
Spray, Structural Steel, Sandblasting and all Tank Work	17.15	6.44
Lead Abatement	18.15	6.44

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PAIN1292B 07/01/1998

	Rates	Fringes
BOLLINGER, BUTLER, CAPE GIRARDEAU, CARTER, DUNKLIN, MISSISSIPPI, NEW MADRID, OREGON, PEMISCOT, PERRY, REYNOLDS, RIPLEY, SCOTT, SHANNON, STODDARD and WAYNE COUNTIES		
PAINTERS:		
Commercial & Light Industrial	14.55	4.54
Heavy Industrial (Brush & Roller)	17.05	4.54

Bridges (Brush, Roller & Spray)	22.00	4.54
Spray (Except Commercial)	15.70	4.54
Sandblasting & Waterblasting	19.00	4.54
Pressure Washing	15.75	4.54
Height Rates (All Areas): 50' to 75' per hour (\$0.75)		
75' to 150' per hour (\$1.50)		
150' and over (each additional 50' add \$.50 per hour)		

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PAIN1292F 07/01/1998

	Rates	Fringes
IRON, MADISON, ST. FRANCOIS, STE. GENEVIEVE and WASHINGTON COUNTIES		

PAINTERS:

Commercial and Light Industrial	16.65	4.54
Heavy Industrial (Brush & Roller)	17.65	4.54
Bridges (Brush, Roller & Spray)	22.00	4.54
Spray Painting (Except Commercial)	17.80	4.54
Sandblasting and Waterblasting	19.00	4.54
Pressure Washing	17.85	4.54
Lead Abatement	18.65	4.54
Height Rates (All Areas): 50' to 75' per hour \$0.75		
75' to 150' per hour 1.50		
150' and over (each additional 50' add \$0.50 per hour)		

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PLAS0368C 04/01/1995

	Rates	Fringes
BENTON, CALLAWAY, CAMDEN, COLE, GASCONADE, HENRY, HICKORY, JOHNSON, MARIES, MILLER, MONTGOMERY, MORGAN, OSAGE, PETTIS, SALINE, & ST. CLAIR COUNTIES		
CEMENT MASONS	17.56	1.00

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PLAS0518G 04/01/1999

	Rates	Fringes
CASS (Richards-Gebaur AFB only), CLAY, JACKSON, PLATTE AND RAY COUNTIES		
CEMENT MASONS	20.16	6.90

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PLAS0518K 05/01/1998

	Rates	Fringes
ANDREW, ATCHISON, BUCHANAN, BATES, CALDWELL, CARROLL, CASS (Except Richards-Gebaur AFB) CLINTON, DAVIESS, DEKALB, GENTRY, GRUNDY, HARRISON, HOLT, JACKSON, LAFAYETTE, LIVINGSTON, MERCER, NODAWAY AND WORTH COUNTIES		
CEMENT MASONS	19.95	5.23

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\* PLAS0527A 05/01/1999

	Rates	Fringes
JEFFERSON, ST. CHARLES COUNTIES AND ST. LOUIS (City and County)		
CEMENT MASONS	22.48	8.62
FRANKLIN, LINCOLN, AND WARREN COUNTIES		
CEMENT MASONS	21.31	8.62

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\* PLAS0527D 06/01/1999

	Rates	Fringes
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CRAWFORD, DENT, IRON, MADISON, MARION, PHELPS, PIKE, PULASKI,  
RALLS, REYNOLDS, ST. FRANCOIS, STE. GENEVIEVE, SHANNON, TEXAS,  
WASHINGTON COUNTIES

CEMENT MASONS	19.80	8.51
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PLAS0908A 05/01/1996

	Rates	Fringes
BOLLINGER, BUTLER, CAPE GIRARDEAU, CARTER, DUNKLIN, MISSISSIPPI, NEW MADRID, OREGON, PEMISCOT, PERRY, RIPLEY, SCOTT, STODDARD, AND WAYNE COUNTIES		

CEMENT MASONS	16.15	3.95
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PLAS0908D 04/17/1995

	Rates	Fringes
BARRY, BARTON, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HOWELL, JASPER, LACLEDE, LAWRENCE, MCDONALD, NEWTON, OZARK, POLK, STONE, TANEY, VERNON, WEBSTER, AND WRIGHT COUNTIES		

CEMENT MASONS	14.60	.80
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PLUM0008C 06/01/1997

	Rates	Fringes
CASS, CLAY, JACKSON, JOHNSON, PLATTE COUNTIES		

PLUMBERS	24.64	6.02
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BATES, BENTON, CARROLL, HENRY, LAFAYETTE, MORGAN,  
PETTIS, RAY, ST. CLAIR, SALINE, AND VERNON COUNTIES

PLUMBERS	22.20	6.02
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PLUM0035C 01/01/1999

	Rates	Fringes
CAMDEN, COLE, CRAWFORD, FRANKLIN, JEFFERSON, MARIES, MILLER, MONITEAU, OSAGE, PHELPS, PULASKI, ST. CHARLES, ST. LOUIS (City and County), WARREN and WASHINGTON COUNTIES		

PLUMBERS	24.855	9.52
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PLUM0045D 09/01/1998

	Rates	Fringes
ANDREW, ATCHISON, BUCHANAN, CALDWELL, CLINTON, DAVIESS, DEKALB, GENTRY, HARRISON, HOLT, NODAWAY AND WORTH COUNTIES		

PLUMBERS & PIPEFITTERS	23.00	7.60
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PLUM0178D 11/01/1998

	Rates	Fringes
BARRY, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY, LACLEDE, LAWRENCE, POLK, STONE, TANEY, WEBSTER, AND WRIGHT COUNTIES		

PLUMBERS & PIPEFITTERS	20.27	6.20
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PLUM0317B 07/01/1995

	Rates	Fringes
BOONE, CALLAWAY, COOPER, HOWARD, AND RANDOLPH COUNTY (Southern half)		

PLUMBERS & PIPEFITTERS	19.18	3.17
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PLUM0533E 06/01/1998

	Rates	Fringes
BATES, BENTON, CARROLL, CASS, CLAY, HENRY, HICKORY, JACKSON, JOHNSON, LAFAYETTE, MORGAN, PETTIS, PLATTE, RAY, SALINE,		

## ST. CLAIR AND VERNON COUNTIES

PIPEFITTERS	24.83	8.63
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\* PLUM0562D 06/01/1999

	Rates	Fringes
ADAIR, AUDRAIN, BOLLINGER, BUTLER, CAMDEN, CAPE GIRARDEAU, CARTER, CHARITON, CLARK, COLE, CRAWFORD, DENT, DUNKLIN, FRANKLIN GASCONADE, GRUNDY, HOWELL, IRON, JEFFERSON, KNOX, LEWIS, LINCOLN, LINN, LIVINGSTON, MACON, MADISON, MARIES, MARION, MERCER, MILLER, MISSISSIPPI, MONITEAU, MONROE, MONTGOMERY, NEW MADRID, NORTHERN HALF OF RANDOLPH, OREGON, OSAGE, PEMISCOTT, PERRY, PHELPS, PIKE, PULASKI, PUTNAM, RALLS, REYNOLDS, RIPLEY, ST. CHARLES, ST. FRANCOIS, STE. GENEVIEVE, ST. LOUIS, SCHUYLER, SCOTLAND, SCOTT, SHANNON, SHELBY, STODDARD, SULLIVAN, TEXAS, WARREN, WASHINGTON, AND WAYNE COUNTIES.		
PIPEFITTERS	25.00	11.03

PLUM0658B 07/01/1998

	Rates	Fringes
BARTON, JASPER, MCDONALD, AND NEWTON COUNTIES		
PLUMBERS & PIPEFITTERS	16.73	5.33

TEAM0013H 05/01/1997

	Rates	Fringes
FRANKLIN, JEFFERSON, AND ST. CHARLES COUNTIES		
TRUCK DRIVERS:		
GROUP 1	26.04	
GROUP 2	26.15	
GROUP 3	26.19	
GROUP 4	26.26	
LINCOLN AND WARREN COUNTIES		
TRUCK DRIVERS:		
GROUP 1	24.69	
GROUP 2	24.80	
GROUP 3	24.84	
GROUP 4	24.91	
AUDRAIN, BOLLINGER, BOONE, CALLAWAY, CAPE GIRARDEAU, CARTER, COLE, CRAWFORD, DENT, GASCONADE, IRON, MACON, MADISON, MARIES, MARION, MILLER, MISSISSIPPI, MONROE, MONTGOMERY, NEW MADRID, OSAGE, PEMISCOT, PERRY, PHELPS, PIKE, PULASKI, RALLS, REYNOLDS, ST. FRANCOIS, STE. GENEVIEVE, SCOTT, SHANNON, SHELBY, STODDARD, TEXAS, WASHINGTON, AND WAYNE COUNTIES		
TRUCK DRIVERS:		
GROUP 1	18.57	4.40
GROUP 2	18.73	4.40
GROUP 3	18.72	4.40
GROUP 4	18.84	4.40
ADAIR, BUTLER, CLARK, DUNKIN, HOWELL, KNOX, LEWIS, OREGON, PUTNAM, RIPLEY, SCHUYLER, AND SCOTLAND COUNTIES		
TRUCK DRIVERS:		
GROUP 1	17.84	4.40
GROUP 2	18.00	4.40
GROUP 3	17.99	4.40
GROUP 4	18.11	4.40

## TRUCK DRIVERS CLASSIFICATIONS:

GROUP 1: Flat Bed Trucks, Single Axle; Station Wagons; Pickup Trucks; Material Trucks, Single Axle; Tank Wagon,

Single Axle  
 GROUP 2: Agitator and Transit Mix Trucks  
 GROUP 3: Flat Bed Trucks, Tandem Axle; Articulated Dump Trucks; Material Trucks, Tandem Axle; Tank Wagon, Tandem Axle  
 GROUP 4: Semi and/or Pole Trailers; Winch, Fork & Steel Trucks; Distributor Drivers and Operators; Tank Wagon, Semi-Trailer; Insley Wagons, Dumpsters, Half-Tracks, Speedace, Euclids and other similar equipment; A-Frame and Derrick Trucks; Float or Low Boy

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 MO990001 - 1

TEAM0056A 05/01/1999

Rates Fringes  
 BUCHANAN, CASS (Except Richards-Gebaur AFB), JOHNSON, AND LAFAYETTE COUNTIES

TRUCK DRIVERS:

GROUP 1	20.88	5.00
GROUP 2	20.99	5.00
GROUP 3	21.03	5.00
GROUP 4	21.10	5.00

ANDREW, BARTON, BATES, BENTON, CALDWELL, CAMDEN, CARROLL, CEDAR, CHARITON, CHRISTIAN, CLINTON, COOPER, DADE, DALLAS, DAVIESS, DEKALB, DOUGLAS, GREENE, HENRY, HICKORY, HOWARD, JASPER, LACLEDE, LAWRENCE, LINN, LIVINGSTON, MONITEAU, MORGAN, NEWTON, PETTIS, POLK, RANDOLPH, ST CLAIR, SALINE, VERNON, WEBSTER, AND WRIGHT COUNTIES

TRUCK DRIVERS:

GROUP 1	19.67	5.00
GROUP 2	19.82	5.00
GROUP 3	19.83	5.00
GROUP 4	19.94	5.00

ATCHISON, BARRY, GENTRY, GRUNDY, HARRISON, HOLT, MCDONALD, MERCER, NODADWAY, OZARK, STONE, SULLIVAN, TANEY AND WORTH COUNTIES

TRUCK DRIVERS:

GROUP 1	18.94	5.00
GROUP 2	19.09	5.00
GROUP 3	19.10	5.00
GROUP 4	19.21	5.00

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Flat bed trucks single axle; station wagons; pickup trucks; material trucks single axle; tank wagons single axle.  
 GROUP 2: Agitator and transit mix-trucks.  
 GROUP 3: Flat bed trucks tandem axle; articulated dump trucks; material trucks tandem axle; tank wagons tandem axle.  
 GROUP 4: Semi and/or pole trailers; winch, fork & steel trucks; distributor drivers & operators; tank wagons semi-trailer; insley wagons, dumpsters, half-tracks, speedace, euclids & other similar equipment; A-frames and derrick trucks; float or low boy.

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 TEAM0245C 03/25/1998

Rates Fringes  
 BARRY, BARTON, CAMDEN, CEDAR, CHRISTIAN, DALLAS, DENT, DOUGLAS,

GREENE, HICKORY, HOWELL, JASPER, LACLEDE, LAWRENCE, MCDONALD, MILLER, NEWTON, OZARK, PHELPS, POLK, PULASKI, SHANNON, STONE, TANEY, TEXAS, VERNON, WEBSTER AND WRIGHT COUNTIES

TRUCK DRIVERS:

Traffic Control Service Driver 12.90 3.56+a

PAID HOLIDAYS: New Year's Day, Decoration Day, July 4th,  
Labor Day, Thanksgiving Day, Christmas Day,  
Employee's birthday and 2 personal days.

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TEAM0541A 04/01/1999

Rates Fringes  
CASS (Richards-Gebaur AFB), CLAY, JACKSON, PLATTE, AND RAY  
COUNTIES

TRUCK DRIVERS:

GROUP 1	20.76	6.25
GROUP 2	20.27	6.25
GROUP 3	19.79	6.25

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: Mechanics and Welders, Field; A-Frame Low Boy-Boom  
Truck Driver.

GROUP 2: Articulated Dump Truck; Insley Wagons: Dump Trucks,  
Excavating, 5 cu yds and over; Dumpsters; Half-Tracks:  
Speedace: Euclids & similar excavating equipment.  
Material trucks, Tandem Two teams; Semi-Trailers;  
Winch trucks-Fork trucks; Distributor Drivers  
and Operators; Agitator and Transit Mix; Tank Wagon  
Drivers, Tandem or Semi; One Team; Station Wagons;  
Pickup Trucks; Material Trucks, Single Axle; Tank  
Wagon Drivers, Single Axle

GROUP 3: Oilers and Greasers - Field

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\* TEAM0541C 03/25/1999

Rates Fringes  
BATES, CASS, CLAY, HENRY, JACKSON, JOHNSON, LAFAYETTE, PLATTE,  
AND RAY COUNTIES

TRUCK DRIVERS:

Traffic Control Service Driver 13.65 2.44+a

a. PAID HOLIDAYS: New Year's Day, Decoration Day, July 4th,  
Labor Day, Thanksgiving Day, Christmas Day,  
Employee's birthday and 2 personal days.

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TEAM0682D 05/01/1996

Rates Fringes  
ST LOUIS CITY AND COUNTY

TRUCK DRIVERS:

GROUP 1	19.57	5.375+a
GROUP 2	19.77	5.375+a
GROUP 3	19.87	5.375+a

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1 - Pick-up trucks; forklift, single axle; flatbed trucks;  
job site ambulance, and trucks or trailers of a water level  
capacity of 11.99 cu. yds. or less

GROUP 2 - Trucks or trailers of a water level capacity of 12.0 cu  
yds. up to 22.0 cu yds. including euclids, speedace and similar  
equipment of same capacity and compressors

GROUP 3 - Trucks or trailers of a water level capacity of 22.0  
cu. yds & over including euclids, speedace & all floats, flatbed

trailers, boom trucks, winch trucks, including small trailers, farm wagons tilt-top trailers, field offices, tool trailers, concrete pumps, concrete conveyors & gasoline tank trailers and truck mounted mobile concrete mixers

FOOTNOTE FOR TRUCK DRIVERS:

- a. PAID HOLIDAYS: Christmas Day, Independence Day, Labor Day, Memorial Day, Veterans Day, New Years Day, Thanksgiving Day

PAID VACATION: 3 days paid vacation for 600 hours of service in any one contract year; 4 days paid vacation for 800 hours of service in any one contract year; 5 days paid vacation for 1,000 hours of services in any one contract years.

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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)).

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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

PLANT AND EQUIPMENT SCHEDULE

[TO BE ATTACHED TO BID FORM]

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AVAILABLE PLANT TO BE USED

\* \_\_\_\_\_

No.	TYPE	CAPACITY	MANUFACTURER	AGE & CONDITON	LOCATION
			* _____		
			* _____		

\*PROVIDE SEPARATE TABLE FOR EACH TYPE OF EQUIPMENT SUCH AS CONCRETE PLANT, MATERIAL HANDLING, HAULING, ETC. USE ADDITIONAL PAGE IF NECESSARY.

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1	52.252-1	SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (FEB 1998)
2	52.214-35	SUBMISSION OF OFFERS IN U.S. CURRENCY (APR 1991)
3	52.211-2	AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) AND DESCRIPTIONS LISTED IN THE ACQUISITION MANAGEMENT SYSTEMS AND DATA REQUIREMENTS CONTROL LIST, DOD 5010.12-L (AUG 1998)
4	52.214-1	SOLICITATION DEFINITIONS--SEALED BIDDING (JUL 1987)
5	52.214-3	AMENDMENTS TO INVITATIONS FOR BIDS (DEC 1989)
6	52.214-4	FALSE STATEMENTS IN BIDS (APR 1984)
7	52.214-5	SUBMISSION OF BIDS (MAR 1997)
8	52.214-6	EXPLANATION TO PROSPECTIVE BIDDERS (APR 1984)
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## SECTION 00100

## INSTRUCTIONS, CONDITIONS, AND NOTICES TO BIDDERS

## 1 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (FEB 1998)

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. The offeror is cautioned that the listed provisions may include blocks that must be completed by the offeror and submitted with its quotation or offer. In lieu of submitting the full text of those provisions, the offeror may identify the provision by paragraph identifier and provide the appropriate information with its quotation or offer. Also, the full text of a solicitation provision may be accessed electronically at these addresses:

<http://www.arnet.gov/far>

<http://farsite.hill.af.mil>

<http://www.dtic.mil/dfars>  
(End of provision)

2 52.214-35 SUBMISSION OF OFFERS IN U.S. CURRENCY (APR 1991)  
(Reference 14.201-6y &)

## 3 52.211-2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) AND DESCRIPTIONS LISTED IN THE ACQUISITION MANAGEMENT SYSTEMS AND DATA REQUIREMENTS CONTROL LIST, DOD 5010.12-L (AUG 1998)

(a) Copies of specifications, standards, and data item descriptions cited in this solicitation may be obtained for a fee by submitting a request to the--Department of Defense Single Stock Point (DoDSSP), Building 4, Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Telephone (215) 697-2667/2179, Facsimile (215) 697-1462.

(b) Order forms, pricing information, and customer support information may be obtained--

(1) By telephone at (215) 697-2667/2179; or

(2) Through the DoDSSP Internet site at <http://www.dodssp.daps.mil>.  
(End of provision)

## 4 52.214-1 SOLICITATION DEFINITIONS--SEALED BIDDING (JUL 1987)

"Government" means United States Government.

"Offer" means "bid" in sealed bidding.

"Solicitation" means an invitation for bids in sealed bidding.

(End of provision)

5 52.214-3 AMENDMENTS TO INVITATIONS FOR BIDS (DEC 1989)

(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.

(End of provision)

6 52.214-4 FALSE STATEMENTS IN BIDS (APR 1984)

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.

(End of provision)

(R 2-201(b)(xiii))

(R 1-2.201(a)(11))

7 52.214-5 SUBMISSION OF BIDS (MAR 1997)

(a) Bids and bid modifications shall be submitted in sealed envelopes or packages (unless submitted by electronic means) (1) addressed to the office specified in the solicitation, and (2) showing the time and date 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.

(End of provision)

8 52.214-6 EXPLANATION TO PROSPECTIVE BIDDERS (APR 1984)

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.

(End of provision)  
(R SF 33A, Para 3, 1978 JAN)

9 52.214-7 LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS OF BIDS (MAY 1997)

(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 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);

(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 of 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 identity 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.

(End of provision)

10 52.214-18 PREPARATION OF BIDS--CONSTRUCTION (APR 1984)

(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 bid 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.

(End of provision)

(R SF 22, Para 5, 1978 FEB)

11 52.214-19 CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION (AUG 1996)

(a) 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 and the price-related factors specified elsewhere in the solicitation.

(b) The Government may reject any or all bids, and waive informalities or minor irregularities in bids received.

(c) 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.

(d) 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.

(End of provision)

12 52.214-34 SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE (APR 1991)

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

(End of provision)

13 52.216-1 TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a Fixed Price Construction contract resulting from this solicitation.

(End of provision)

14 52.225-12 NOTICE OF BUY AMERICAN ACT REQUIREMENT-CONSTRUCTION MATERIALS (MAY 1997)

(a) Offerors are required to comply with the requirements of Federal Acquisition Regulation (FAR) clause 52.225-5, Buy American Act Construction Materials, of this solicitation. The terms "construction material" and "domestic construction material," as used in this provision, have the meanings set forth in FAR clause 52.225-5.

(b) Offerors should request a determination regarding the inapplicability of the Buy American Act in time to allow determination before submission of offers. For evaluation of a request for a determination regarding the inapplicability of the requirements of the Buy American Act prior to the time set for receipt of offers, the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-5 shall be included in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act prior to submission of its offer, or has not received a response to a request made prior to submission of its offer, the information and supporting data shall be included in the offer.

(c) Evaluation of offers.

(1) For evaluation of offers, (unless agency regulations specify a higher percentage) the Government will add to the offered price 6 percent of the cost of any foreign construction material proposed for exception from the requirements of the Buy American Act based on claimed unreasonable cost of domestic construction materials in accordance with paragraph (b)(3)(i) of FAR clause 52.225-5.

(2) If the evaluation of offers results in a tie between an offer including such foreign construction material excepted on the basis of unreasonable cost, as evaluated, and an offer including solely domestic construction material or other foreign construction material listed in the solicitation at paragraph (b)(2) of FAR clause 52.225-5, or subsequently excepted in accordance with paragraphs (b)(3) (ii) or (iii) of FAR clause 52.225-5, award shall be made to the offeror that submitted the latter offer.

(d) Alternate offers.

(1) When an offer includes foreign construction material not listed by the Government in the solicitation at paragraph (b)(2) of FAR clause 52.225-5, offerors also may submit alternate offers based on use of equivalent domestic construction material.

(2) If alternate offers are submitted, a separate Standard Form 1442 shall be submitted for each alternate offer, and a separate price comparison table, prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-5, shall be submitted for each offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception to apply.

(3) If the Government determines that a particular exception requested under paragraph (c) of FAR clause 52.225-5 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic construction material, and the offeror shall be required to furnish such domestic construction material.

(i) In sealed bid procurements, any offer based on use of that particular foreign construction material shall be rejected as nonresponsive.

(ii) In negotiated procurements, any offer based on use of that particular foreign construction material may not be accepted unless revised during negotiations.

(End of provision)

15 52.228-1 BID GUARANTEE (SEP 1996)

(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, e.g., 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 (twenty) percent of the bid price or \$3,000,000.00, 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.

(End of provision)

16 52.233-2 SERVICE OF PROTEST (AUG 1996)

(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

Chief, Contracting Division  
ATTN: CEMVM-CT Room 681  
Department of the Army  
Memphis District Corps of Engineers  
167 North Main Street B202  
Memphis, Tennessee 38103-1894

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

(End of provision)

17 52.236-7008 CONTRACT PRICES--BIDDING SCHEDULES (DEC 1991)

(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 listed in the Bidding Schedule all costs for work in the specifications, whether or not specifically listed in the Bidding Schedule.

(End of provision)

18 52.214-5000 ARITHMETIC DISCREPANCIES (MAR 1995)--EFARS

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

(1) Obviously misplaced decimal points will be corrected;

(2) Discrepancy between unit price and extended price, the unit price will govern;

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

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

(b) For the purpose of bid evaluation, the government will proceed on the assumption that the bidder intends his bid to be evaluated on 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.

(End of statement)

19 52.0-4019 PREAWARD INFORMATION

Each bidder shall, upon request of the Contracting Officer, furnish a statement of whether he is now or ever has been engaged in any work similar to that covered by the specifications herein, the dollar value thereof, the year in which such work was performed, and the manner of its execution and giving such other information as will tend

to show the bidder's ability to prosecute the required work. The "such other information" referred to above shall include but is not limited to the following:

(a) The name and address of the office or firm under which such similar work was performed.

(b) A list of key personnel available for the instant project and their qualifications.

(c) A copy of bidder's latest financial statement, including the names of banks or other financial institutions with which the bidder conducts business. If the financial statement is more than 60 days old, a certificate should be attached stating that financial condition is substantially the same, or if not the same, the changes that have taken place. Such statement will be treated as confidential.

(d) A list of present commitments, including the dollar value thereof, and name of office under which work is being performed.

20      52.0-4047            SITE OF THE WORK

Bidders are advised that for the purpose of applicability of the Davis-Bacon Act and other contract labor standards provisions, "the site of the work" under the contract to be awarded pursuant to the solicitation may not be limited to the physical place(s) where the construction called for in the contract will remain when work on it has been completed. The "site of the work" may include other adjacent or nearby property used by the contractor or subcontractors during such construction. For example, fabrication plants, mobile factories, batch plants, borrow pits, job headquarters, tool yards, etc., will be considered part of the site of the work, provided they are dedicated exclusively or nearly so to performance on the contract and are located in proximity to the actual construction location that it would be reasonable to include them.

21      52.0-4048            QUANTITY ESTIMATES

Estimates of quantities involved in certain items of work for which bids are being solicited on a lump sum or job basis have been made for the use of the Government. Copies of these quantity estimates may be obtained from the U S Army Engineer District Memphis, 167 North Main Street, Room 762, Memphis, Tennessee 38103-1894, telephone 901/544-3236. It is to be expressly understood that the accuracy of these estimates is in no way warranted and that the furnishing of this information to a bidder will not relieve him of his responsibility to estimate the quantities involved. It is further to be expressly understood that in no case will such estimate be used as a basis of claim against the Government.

22      52.0-4049            CONDITIONS AFFECTING THE WORK

Bidders should visit the site and take such other steps as may be reasonably necessary to ascertain the nature and location of the work, and the general and local conditions which can affect the work or the cost thereof. Failure to do so will not relieve bidders from responsibility for estimating properly the difficulty or cost of successfully

performing the work. The Government will assume no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of the contract, unless included in the Solicitation, the specifications, or related documents.

23 52.0-4055 NEGOTIATIONS AFTER SEALED BIDDING

(a) This clause applies if after bid opening the Contracting Officer determines that all otherwise acceptable bids received are at unreasonable prices, or only one bid is received and the Contracting Officer cannot determine the reasonableness of the bid price, or no responsive bid has been received from a responsible bidder; or the bids were not independently arrived at in open competition, were collusive, or were submitted in bad faith.

(b) The Government has the option to reject all bids received in response to the sealed bid advertisement and initiate negotiation. Negotiations will include soliciting offers from each responsible bidder that submits a bid in response to the solicitation.

(c) If after bid opening the Contracting Officer determines under (a) above that negotiations are in the best interest of the Government, the following steps will be followed:

(1) An amendment to the sealed bid advertisement will be issued to each responsible bidder changing the solicitation number to a request for proposal number. The amendment will also make any necessary changes to the scope of work.

(2) A cover letter signed by the negotiator will accompany the amendment explaining the procedures to be followed during negotiations.

(3) In the event there is only one responsible bidder under the initial sealed bid solicitation, cost or pricing data requirements set forth in FAR 15.804 will apply as will clause FAR 52.215-2, "Audit and Records - Negotiation".

24 52.0-4058 PROGRAM DATA

AUTHORITY: The work provided for herein is authorized by the Flood Control Act approved 15 JUN 1936, as amended.

25 52.0-4060 REVISION AND AMENDMENT TO SOLICITATION FOR BIDS

The right is reserved, as the interest of the Government may require, to revise or amend the specifications or drawings or both prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to this Solicitation for Bids. If revisions and amendments are of a nature which requires 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 issuing officer will enable bidders to revise their bids. In such cases, the amendment will include an announcement of new date for opening bids.

26 52.0-4074 CERTIFICATE OF COMPETENCY (APR 1993)

- (a) In the event of a determination of nonresponsibility on a small business offeror, the Contracting Officer will -
- (1) Notify the Offeror, in writing, of the determination and of the Offeror's right, under Section 8(b)(7) of the Small Business Act, to request that the Small Business Administration (SBA) make a determination of the Offeror's responsibility under the Certificate of Competency Program.
  - (2) Withhold award until the Offeror's response is received or 14 calendar days from receipt of the notice by the Offeror.
  - (3) Upon timely receipt of an affirmative response from the Offeror, refer the matter to the SBA.
  - (4) Upon receipt of a negative response from the Offeror, or if a timely response is not received, award to another offeror.
- (b) The Offeror shall notify the Contracting Officer, in writing, within 14 days of receipt of a notification of a nonresponsibility determination, as to whether or not it desires a request for an SBA determination of responsibility.

(DFARS 252.219-7009)

27 52.0-4078 (FAR 52.236-27) SITE VISIT (CONSTRUCTION) (ALTERNATE I)  
(FEB 1995)

(a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, bidders are urged and expected to inspect the site where the work will be performed.

(b) Two organized site visits have been scheduled for **JULY 07** and **JULY 13, 1999**.

(c) BIDDERS DESIRING A SITE VISIT SHALL CONTACT THE AREA ENGINEER AT LEAST ONE DAY PRIOR TO THE SCHEDULED SITE VISIT.

NAME: Stephen P. Shankle  
Area Engineer

ADDRESS: Caruthersville Area Office  
706 Harry S. Truman Boulevard  
Caruthersville, Missouri 63830-1268

TELEPHONE: 901/544-3074 or 573/333-1043

COLLECT TELEPHONE CALLS WILL NOT BE ACCEPTED.

(End of Provision)

28 52.0-4079 SUBMISSION OF OFFERS IN U.S. CURRENCY (APR 1991) FAR  
52.0214-0035

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.

(End of provision)

END OF SECTION 00100

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SECTION 00600

REPRESENTATIONS & CERTIFICATIONS

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

(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) above; 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) above \_\_\_\_\_

(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 named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

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

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

(End of provision)

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

(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 of 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 52.204-3 TAXPAYER IDENTIFICATION (OCT 1998)

(a) Definitions.

Common parent, as used in this 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.

Taxpayer Identification Number (TIN), as used in this provision, means the number required by the Internal Revenue Service (IRS) to be used by the offeror in reporting income tax and other returns. The TIN may be either a Social Security Number or an Employer Identification Number.

(b) All offerors must submit the information required in paragraphs (d) through (f) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M, and implementing regulations issued by the IRS. If the resulting contract is subject to the payment reporting requirements described in Federal Acquisition Regulation (FAR) 4.904, 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) The TIN may be used by the Government to collect and report

on any delinquent amounts arising out of the offeror's relationship with the Government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.

(d) 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 United States and does not have an office or place of business or a fiscal paying agent in the United States;

Offeror is an agency or instrumentality of a foreign government;

Offeror is an agency or instrumentality of the Federal Government.

(e) Type of organization.

Sole proprietorship;

Partnership;

Corporate entity (not tax-exempt);

Corporate entity (tax-exempt);

Government entity (Federal, State, or local);

Foreign government;

International organization per 26 CFR 1.6049-4;

Other \_\_\_\_\_

(f) 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 52.204-5 WOMEN-OWNED BUSINESS (OCT 1995)

(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 52.204-6 DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER (APR 1998)

(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 which 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 <http://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](mailto:globalinfo@mail.dnb.com).

(End of provision)

6 52.209-5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (MAR 1996)

(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)

7 52.219-2 EQUAL LOW BIDS (OCT 1995)

(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)

8 52.219-19 SMALL BUSINESS CONCERN REPRESENTATION FOR THE SMALL BUSINESS COMPETITIVENESS DEMONSTRATION PROGRAM (JAN 1997)

(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). (Check one of the following.)

No. 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)

9 52.222-21 PROHIBITION OF SEGREGATED FACILITIES (FEB 1999)

(a) Segregated facilities, as used in this clause, 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, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

(b) The Contractor agrees 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 Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract.

(c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

(End of clause)

10 52.222-22 PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (FEB 1999)

The offeror represents that--

(a) It /\_/ has, /\_/ has not participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation;

(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)

11 52.223-1 CLEAN AIR AND WATER CERTIFICATION (APR 1984)

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)

(AV 7-2003.71 1977 JUN)

(AV 1-1.2302-1)

12 52.223-13 CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (OCT 1996)

(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 facility 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 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)

13 52.204-7001 COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE REPORTING  
(DEC 1991)

(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.

(End of provision)

14 52.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A  
TERRORIST COUNTRY (MAR 1998)

(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 or, in the case of a subsidiary, the firm that owns the 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)

15 52.0-4031 CORPORATE CERTIFICATION

IF A BIDDER IS A CORPORATION OR IF CORPORATION IS PARTICIPATING IN A JOINT VENTURE, PLEASE COMPLETE THE FOLLOWING CERTIFICATION:

I, \_\_\_\_\_, certify that I am secretary of the corporation named as Contractor herein; that \_\_\_\_\_ who signed this contract on behalf of the Contractor; was then \_\_\_\_\_ of said corporation; that said contract was duly signed for and on behalf of said corporation by authority of its governing body and is within the scope of its corporate powers.

(CORPORATE SEAL)

\_\_\_\_\_  
(Secretary)

IF A CORPORATION IS PARTICIPATING AS A JOINT VENTURE, ITS SECRETARY MUST SUBMIT A CERTIFICATE STATING THE CORPORATION IS AUTHORIZED TO PARTICIPATE.

16 52.0-4096 52.219-1 I & II SMALL BUSINESS PROGRAM REPRESENTATIONS (OCT 1998)--ALTERNATE I (OCT 1998) - ALTERNATE II (JAN 1999)

(a)(1) The standard industrial classification (SIC) code for this acquisition is 1623.

(2) The small business size standard is \$17,000,000.00.

(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, for general statistical purposes, that it [ ] is, [ ] is not, a small disadvantaged business concern as defined in 13 CFR 124.1002.

(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.

(4) (Complete if offeror represented itself as disadvantaged in paragraph (b)(2) of this provision). [The offeror shall check the category in which its ownership falls]:

\_\_\_ Black American.

\_\_\_ Hispanic American.

\_\_\_ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians).

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

\_\_\_ Subcontinent Asian (Asian-Indian) American (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal).

\_\_\_ Individual/concern, other than one of the preceding.

(5) (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--

(i) It \_\_\_ is, \_\_\_ is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal place of ownership, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and

(ii) It \_\_\_ is, \_\_\_ is not a joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (b)(5)(i) of this provision is accurate for the HUBZone small business concern or concerns that are participating in the joint venture. (The offeror shall enter the name or names of the HUBZone small business concern or concerns that are participating in the joint venture: \_\_\_\_\_.)

Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.

(c) Definitions.

"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.

"Women-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)

END OF SECTION 00600

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## SECTION 00700

## CONTRACT CLAUSES

## 1 52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at these addresses:

<http://www.arnet.gov/far>  
<http://farsite.hill.af.mil>  
<http://www.dtic.mil/dfars>  
 (End of clause)

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

(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 (e)(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 (e)(1) or (e)(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 52.203-3 GRATUITIES (APR 1984)

(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) above, 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)

(R 7-104.16 1952 MAR)

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

(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 annul 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 on any basis other than the merits of the matter.

(End of clause)

(R 7-103.20 1958 JAN)

(R 1-1.503)

(R 1-7.102-18)

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

(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 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 subsection 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 52.203-10 PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY  
(JAN 1997)

(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.

(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) The 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 52.203-12 LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JUN 1997)

(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 Congress, or an 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 or 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 his 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 or 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 attempt 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 52.204-4 PRINTING/COPYING DOUBLE-SIDED ON RECYCLED PAPER (JUN 1996)

(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 standard is 50 percent recovered material content of certain industrial by-products.

(End of clause)

10 52.209-6 PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (JUL 1995)

(a) The Government suspends or debars Contractors to protect the Government's interest. 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 reason(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 interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

(End of clause)

11 52.211-18 VARIATION IN ESTIMATED QUANTITY (APR 1984)

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 judgement

of the Contracting Officer, is justified.  
(End of clause)

12 52.214-26 AUDIT AND RECORDS--SEALED BIDDING (OCT 1997)

(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 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)

13 52.214-27 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA--  
MODIFICATIONS--SEALED BIDDING (OCT 1997)

(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) above.

(c) Any reduction in the contract price under paragraph (b) above 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 had 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)

14 52.214-28 SUBCONTRACTOR COST OR PRICING DATA--MODIFICATIONS--SEALED BIDDING (OCT 1997)

(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 specific 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)

15 52.219-8 UTILIZATION OF SMALL BUSINESS CONCERNS (JAN 1999)

(a) It is the policy of the United States that small business concerns, HUBZone 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, HUBZone 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) Definitions. As used in this contract

(1) Small business concern means a small business as defined pursuant to section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto.

(2) HUBZone small business concern means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.

(3) Small business concern owned and controlled by socially and economically disadvantaged individuals means a small business concern that represents, as part of its offer, that it meets the definition of a small disadvantaged business concern in 13 CFR 124.1002.

(4) Small business concern owned and controlled by women means a small business concern--

(i) 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

(ii) Whose management and daily business operations are controlled by one or more women; and

(d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as a small business concern, a HUBZone 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)

16 52.219-9 I SMALL BUSINESS SUBCONTRACTING PLAN (JAN 1999)--ALTERNATE I  
(JAN 1999)

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

(b) Definitions. As used in this clause--

Commercial item means a product or service that satisfies the definition of commercial item in section 2.101 of the Federal Acquisition Regulation.

Commercial plan means a subcontracting plan (including goals) that covers the offeror's fiscal year and that applies to the entire production of commercial items sold by either the entire company or a portion thereof (e.g., division, plant, or product line).

Individual contract plan means a subcontracting plan that covers the entire contract period (including option periods), applies to a specific contract, and has goals that are based on the offeror's planned subcontracting in support of the specific contract, except that indirect costs incurred for common or joint purposes may be allocated on a prorated basis to the contract.

Master plans means a subcontracting plan that contains all the required elements of an individual contract plan, except goals, and may be incorporated into individual contract plans, provided the master plan has been approved.

Subcontract 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, that separately addresses subcontracting with small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns. If the bidder is submitting an individual contract plan, the plan must separately address subcontracting with small business, HUBZone small business, small disadvantaged business, 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, HUBZone small business, small disadvantaged business, 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 for an individual contract plan; or the offeror's total projected sales, expressed in dollars, and the total value of projected subcontracts to support the sales for a commercial plan;

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

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

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

(v) 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) HUBZone small business concerns;

(iii) Small disadvantaged business concerns; and

(iv) 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 method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Marketing and Access Network (PRO-Net) of the Small Business Administration (SBA), the list of certified small disadvantaged business concerns of the SBA, 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, HUBZone small, small disadvantaged, and women-owned small business trade associations). A firm may rely on the information contained in PRO-Net as an accurate representation of a concern's size and ownership characteristics for the purposes of

maintaining a small and women-owned small business source list. A firm shall rely on the information contained in SBA's list of small disadvantaged business concerns as an accurate representation of a concern's size and ownership characteristics for the purposes of maintaining a small disadvantaged business source list. Use of PRO-Net and/or the SBA list of small disadvantaged business concerns as its source lists 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) HUBZone small business concerns;
- (iii) Small disadvantaged business concerns; and
- (iv) 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 business, HUBZone small business, small disadvantaged business, and women-owned small business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurances that the offeror will include the clause of this contract entitled "Utilization of Small Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) that receive subcontracts in excess of \$500,000 (\$1,000,000 for construction of any public facility) to adopt a subcontracting plan that complies with the requirements of this clause.

(10) Assurances that the offeror will--

- (i) Cooperate in any studies or surveys as may be required;
- (ii) Submit periodic reports so that the Government can 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 or as provided in agency regulations and in paragraph (j) of this clause; and
- (iv) Ensure that its subcontractors agree to submit SF 294 and SF 295.

(11) A description of the types of records that will be maintained concerning procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of the offeror's efforts to locate small business, HUBZone small business, small disadvantaged business, 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., PRO-Net), guides, and other data that identify small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns.
- (ii) Organizations contacted in an attempt to locate sources that are small business, HUBZone small business, small disadvantaged

business, 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 HUBZone small business concerns were solicited and, if not, why not;

(C) Whether small disadvantaged business concerns were solicited and, if not, why not;

(D) Whether women-owned small business concerns were solicited and, if not, why not; and

(E) 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, HUBZone 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 commercial 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 business, HUBZone small business, small disadvantaged business, 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 business, HUBZone small business, small disadvantaged business, 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 business, HUBZone small business, small disadvantaged business, and women-owned small business concerns in all "make-or-buy" decisions.

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

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, HUBZone 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 plan on a plant or division-wide basis that contains all the elements required by paragraph (d) of this clause, 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 Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g) A commercial plan is the preferred type of subcontracting plan for contractors furnishing commercial items. The commercial plan shall relate to the offeror's planned subcontracting generally, for both commercial and Government business, rather than solely to the Government contract. Commercial plans are also preferred for subcontractors that provide commercial items under a prime contract, whether or not the prime contractor is supplying a commercial item.

(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 Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

(j) The Contractor shall submit the following reports:

(1) Standard Form 294, Subcontracting Report for Individual Contracts. This report shall be submitted to the Contracting Officer semiannually and at contract completion. The report covers subcontract award data related to this contract. This report is not required for commercial plans.

(2) Standard Form 295, Summary Subcontract Report. This report encompasses all the contracts with the awarding agency. It must be submitted semi-annually for contracts with the Department of Defense and annually for contracts with civilian agencies. If the reporting activity is covered by a commercial plan, the reporting activity must report annually all subcontract awards under that plan. All reports submitted at the close of each fiscal year (both individual and commercial plans) shall include a breakout, in the Contractor's format, of subcontract awards, in whole dollars, to small disadvantaged business concerns by Standard Industrial Classification (SIC) Major Group. For a commercial plan, the Contractor may obtain from each of its subcontractors a predominant SIC Major Group and report all awards to that subcontractor under its predominant SIC Major Group.

(End of clause)

17 52.219-16 LIQUIDATED DAMAGES--SUBCONTRACTING PLAN (JAN 1999)

(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 Business Subcontracting Plan," or willful or intentional action to frustrate the plan.

(b) Performance shall be measured by applying the percentage goals to the total actual subcontracting dollars or, if a commercial plan is involved, to the pro rata share of actual subcontracting dollars attributable to Government contracts covered by the commercial plan. If, at contract completion or, in the case of a commercial 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 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.

(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 and to discuss the matter. Failure to respond to the notice may be taken as an admission that no valid explanation exists. If, after consideration of all the 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 plans, the Contracting Officer who approved the plan will perform the functions of the Contracting Officer under this clause on behalf of all agencies with contracts covered by the commercial 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)

18 52.222-3 CONVICT LABOR (AUG 1996)

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



(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)

20 52.222-6 DAVIS-BACON ACT (FEB 1995)

(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 approve 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.

(iv) With respect to helpers, such a classification prevails in the area in which the work is performed.

(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)

21 52.222-7 WITHHOLDING OF FUNDS (FEB 1988)

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)

22 52.222-8 PAYROLLS AND BASIC RECORDS (FEB 1988)

(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 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)

23 52.222-9 APPRENTICES AND TRAINEES (FEB 1988)

(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 rate) 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)

are hereby incorporated by reference in this contract.  
(End of clause)

25 52.222-11 SUBCONTRACTS (LABOR STANDARDS) (FEB 1988)

(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 deliver 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 deliver to the Contracting Officer an updated completed SF 1413 for such additional subcontract.  
(End of clause)

26 52.222-12 CONTRACT TERMINATION--DEBARMENT (FEB 1988)

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)

27 52.222-13 COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988)

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)

28 52.222-14 DISPUTES CONCERNING LABOR STANDARDS (FEB 1988)

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 of their representatives.

(End of clause)

29 52.222-15 CERTIFICATION OF ELIGIBILITY (FEB 1988)

(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)

30 52.222-26 EQUAL OPPORTUNITY (FEB 1999)

(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) of this clause. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.

(b) During performance of 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. However, it shall not be a violation of this clause for the Contractor to extend a publicly announced preference in employment to Indians living on or near an Indian reservation, in connection with employment opportunities on or near an Indian reservation, as permitted by 41 CFR 60-1.5.

(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 advertisements 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. The Contractor shall also file Standard Form 100 (EEO-1), or any successor form, as prescribed in 41 CFR part 60-1. Unless the Contractor has filed within the 12 months preceding the date of contract award, the Contractor shall, within 30 days after contract award, apply to either the regional Office of Federal Contract Compliance Programs (OFCCP) or the local office of the Equal Employment Opportunity Commission for the necessary forms.

(8) The Contractor shall permit access to its premises, during normal business hours, by the contracting agency or the OFCCP for the purpose of conducting on-site compliance evaluations and complaint investigations. The Contractor shall permit the Government to inspect and copy any books, accounts, records (including computerized records), and other material that may be relevant to the matter under investigation and pertinent to compliance with Executive Order 11246, as amended, and rules and regulations that implement the Executive Order.

(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; in 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 subparagraphs (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 subcontractor or vendor.

(11) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting officer 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)

31      52.222-27      AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR  
CONSTRUCTION (FEB 1999)

(a) Definitions.

"Covered area," as used in this clause, means the geographical area

described in the solicitation for this contract.

"Deputy Assistant Secretary," as used in this clause, means the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, or a designee.

"Employer's 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 Form 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);

(3) Black (all persons having origins in any of the black African racial groups not of Hispanic origin); and

(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 Deputy Assistant Secretary 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) of this clause.

(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 on-site supervisory personnel before initiating construction work at a job site. A written record shall be made and 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 rest rooms and necessary dressing or sleeping areas shall be provided to assure privacy between the 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 action obligations contained in subparagraphs (g)(1) through (16) of this clause. The efforts of a contractor association, joint contractor-union, contractor-community, or similar group of which the contractor is a member and participant may be asserted as fulfilling one or more of its obligations under subparagraphs (g)(1) through (16) of this clause, 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) Makes 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) of this clause, 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 Deputy Assistant Secretary 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)

(a) Definitions. 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 consideration will be given to persons outside the Contractor's organization (including any 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 employer 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 for 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 that 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)

(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 disability. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified individuals with disabilities without discrimination based upon their physical or mental disability in all employment practices such as--

(i) Recruitment, advertising, and job application procedures;

(ii) Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff, and rehiring;

(iii) Rates of pay or any other form of compensation and changes in compensation;

(iv) Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;

(v) Leaves of absence, sick leave, or any other leave;

(vi) Fringe benefits available by virtue of employment, whether or not administered by the Contractor;

(vii) Selection and financial support for training, including apprenticeships, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;

(viii) Activities sponsored by the Contractor, including social or recreational programs; and

(ix) Any other term, condition, or privilege of employment.

(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 individuals with disabilities; 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. The Contractor shall ensure that applicants and employees with disabilities are informed of the contents of the notice (e.g., the Contractor may have the notice read to a visually disabled individual, or may lower the posted notice so that it might be read by a person in a wheelchair). The notices shall be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance of the U.S. Department of Labor (Deputy Assistant Secretary) and shall be 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 individuals with physical or mental disabilities.

(c) 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 \$10,000 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)

34 52.222-37 EMPLOYMENT REPORTS ON DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (JAN 1999)

(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 workforce 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 September 30 of each year beginning September 30, 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 date 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 1st 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)

35 52.223-2 CLEAN AIR AND WATER (APR 1984)

(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 all 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)

(R 7-103.29 1975 OCT)

(R 1-1.2302)

36 52.223-3 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA  
(JAN 1997)

(a) "Hazardous material," as used in this clause, includes any material defined as hazardous under the latest version of Federal Standard No. 313

(including revisions adopted during the term of the contract).

(b) The Offeror must list any hazardous material, as defined in paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number. This information shall also be included on the Material Safety Data Sheet submitted under this contract.

Material	Identification No.
(If none, insert None)	
_____	_____
_____	_____
_____	_____

(c) This list must be updated during performance of the contract whenever the Contractor determines that any other material to be delivered under this contract is hazardous.

(d) The apparently successful Offeror agrees to submit, for each item as required prior to award, a Material Safety Data Sheet, meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous material identified in paragraph (b) of this clause. Data shall be submitted in accordance with Federal Standard No. 313, whether or not the apparently successful Offeror is the actual manufacturer of these items. Failure to submit the Material Safety Data Sheet prior to award may result in the apparently successful Offeror being considered nonresponsible and ineligible for award.

(e) If, after award, there is a change in the composition of the item(s) or a revision to Federal Standard No. 313, which renders incomplete or inaccurate the data submitted under paragraph (d) of this clause, the Contractor shall promptly notify the Contracting Officer and resubmit the data.

(f) Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.

(g) Nothing contained in this clause shall relieve the Contractor from complying with applicable Federal, State, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

(h) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

(1) To use, duplicate and disclose any data to which this clause is applicable. The purposes of this right are to--

(i) Apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials;

(ii) Obtain medical treatment for those affected by the material; and

(iii) Have others use, duplicate, and disclose the data for the Government for these purposes.

(2) To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph (h)(1) of this clause, in precedence over any other clause of this contract providing for rights in data.

(3) The Government is not precluded from using similar or data acquired from other sources.

(End of clause)

(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)

38 52.223-14 TOXIC CHEMICAL RELEASE REPORTING (OCT 1996)

(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 Inventory 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 filed with EPA);

(4) The facility does not fall within 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 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)

39 52.225-5 BUY AMERICAN ACT--CONSTRUCTION MATERIALS (JUN 1997)

(a) 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 materials," 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:

NONE

(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 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.

(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 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 contact 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)

(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 by Executive order or regulations of the Office of Foreign Assets Control, Department of the Treasury. Those countries include Cuba, Iran, Iraq, Libya, North Korea, and Sudan.

(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)

(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 52.219-9, 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.

(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 Indian 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. 1542(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 working 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. Contracting Officers shall seek funding in accordance with agency procedures. The Contracting Officer's decision is final and not subject to the Disputes clause of this contract.

(End of clause)

42 52.227-1 AUTHORIZATION AND CONSENT (JUL 1995)

(a) The Government authorizes and consents to all use and manufacture, in performing this 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



(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)

46 52.228-11 PLEDGES OF ASSETS (FEB 1992)

(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 owners; 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)

47 52.228-12 PROSPECTIVE SUBCONTRACTOR REQUESTS FOR BONDS (OCT 1995)

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)

48 52.228-14 IRREVOCABLE LETTER OF CREDIT (OCT 1997)

(a) "Irrevocable letter of credit" (ILC), as used in this clause, means a written commitment by a federally insured financial institution to pay all or part of a stated amount of money, until the expiration date of the

letter, upon presentation by the Government (the beneficiary) of a written demand therefor. Neither the financial institution nor the offeror/Contractor can revoke or condition the letter of credit.

(b) If the offeror intends to use an ILC in lieu of a bid bond, or to secure other types of bonds such as performance and payment bonds, the letter of credit and letter of confirmation formats in paragraphs (e) and (f) of this clause shall be used.

(c) The letter of credit shall be irrevocable, shall require presentation of no document other than a written demand and the ILC (including confirming letter, if any), shall be issued/confirmed by an acceptable federally insured financial institution as provided in paragraph (d) of this clause, and--

(1) If used as a bid guarantee, the ILC shall expire no earlier than 60 days after the close of the bid acceptance period;

(2) If used as an alternative to corporate or individual sureties as security for a performance or payment bond, the offeror/Contractor may submit an ILC with an initial expiration date estimated to cover the entire period for which financial security is required or may submit an ILC with an initial expiration date that is a minimum period of one year from the date of issuance. The ILC shall provide that, unless the issuer provides the beneficiary written notice of non-renewal at least 60 days in advance of the current expiration date, the ILC is automatically extended without amendment for one year from the expiration date, or any future expiration date, until the period of required coverage is completed and the Contracting Officer provides the financial institution with a written statement waiving the right to payment. The period of required coverage shall be:

(i) For contracts subject to the Miller Act, the later of--

(A) One year following the expected date of final payment;

(B) For performance bonds only, until completion of any warranty period; or

(C) For payment bonds only, until resolution of all claims filed against the payment bond during the one-year period following final payment.

(ii) For contracts not subject to the Miller Act, the later of--

(A) 90 days following final payment; or

(B) For performance bonds only, until completion of any warranty period.

(d) Only federally insured financial institutions rated investment grade or higher shall issue or confirm the ILC. The offeror/Contractor shall provide the Contracting Officer a credit rating that indicates the financial institution has the required rating(s) as of the date of issuance of the ILC. Unless the financial institution issuing the ILC had letter of credit business of at least \$25 million in the past year, ILCs over \$5 million must be confirmed by another acceptable financial institution that had letter of credit business of at least \$25 million in the past year.

(e) The following format shall be used by the issuing financial institution to create an ILC:

(Issuing Financial Institution's Letterhead or Name and Address)

Issue Date \_\_\_\_\_

Irrevocable Letter of Credit No. \_\_\_\_\_

Account party's name \_\_\_\_\_

Account party's address \_\_\_\_\_

For Solicitation No. \_\_\_\_\_

(For reference only)

TO: (U.S. Government agency)

(U.S. Government agency's address)

1. We hereby establish this irrevocable and transferable Letter of Credit in your favor for one or more drawings up to United States \$\_\_\_\_\_. This Letter of Credit is payable at (issuing financial institution's and, if any, confirming financial institution's) office at (issuing financial institution's address and, if any, confirming financial institution's address) and expires with our close of business on \_\_\_\_\_, or any automatically extended expiration date.

2. We hereby undertake to honor your or the transferee's sight draft(s) drawn on the issuing or, if any, the confirming financial institution, for all or any part of this credit if presented with this Letter of Credit and confirmation, if any, at the office specified in paragraph 1 of this Letter of Credit on or before the expiration date or any automatically extended expiration date.

3. (This paragraph is omitted if used as a bid guarantee, and subsequent paragraphs are renumbered.) It is a condition of this Letter of Credit that it is deemed to be automatically extended without amendment for one year from the expiration date hereof, or any future expiration date, unless at least 60 days prior to any expiration date, we notify you or the transferee by registered mail, or other receipted means of delivery, that we elect not to consider this Letter of Credit renewed for any such additional period. At the time we notify you, we also agree to notify the account party (and confirming financial institution, if any) by the same means of delivery.

4. This Letter of Credit is transferable. Transfers and assignments of proceeds are to be effected without charge to either the beneficiary or the transferee/assignee of proceeds. Such transfer or assignment shall be only at the written direction of the Government (the beneficiary) in a form satisfactory to the issuing financial institution and the confirming financial institution, if any.

5. This Letter of Credit is subject to the Uniform Customs and Practice (UCP) for Documentary Credits, 1993 Revision, International Chamber of Commerce Publication No. 500, and to the extent not inconsistent therewith, to the laws of \_\_\_\_\_ (state of confirming financial institution, if any, otherwise state of issuing financial institution).

6. If this credit expires during an interruption of business of this financial institution as described in Article 17 of the UCP, the financial institution specifically agrees to effect payment if this credit is drawn against within 30 days after the resumption of our business.

Sincerely,

(Issuing financial institution)

(f) The following format shall be used by the financial institution to confirm an ILC:

(Confirming Financial Institution's Letterhead or Name and Address)

Date \_\_\_\_\_ 19\_\_\_\_\_

Our Letter of Credit Advice Number \_\_\_\_\_

Beneficiary: \_\_\_\_\_

(U.S. Government agency)

Issuing Financial Institution: \_\_\_\_\_

Issuing Financial Institution's LC No.: \_\_\_\_\_

Gentlemen:

1. We hereby confirm the above indicated Letter of Credit, the original of which is attached, issued by \_\_\_\_\_ (name of issuing financial institution) for drawings of up to United States dollars \_\_\_\_\_/U.S. \$\_\_\_\_\_ and expiring with our close of business on \_\_\_\_\_ (the expiration date), or any automatically extended expiration date.

2. Draft(s) drawn under the Letter of Credit and this Confirmation are payable at our office located at \_\_\_\_\_.

3. We hereby undertake to honor sight draft(s) drawn under and presented with the Letter of Credit and this Confirmation at our offices as specified herein.

4. (This paragraph is omitted if used as a bid guarantee, and subsequent paragraphs are renumbered.) It is a condition of this confirmation that it be deemed automatically extended without amendment for one year from the expiration date hereof, or any automatically extended expiration date, unless:

(a) At least 60 days prior to any such expiration date, we shall notify the Contracting Officer, or the transferee and the issuing financial institution, by registered mail or other receipted means of delivery, that we elect not to consider this confirmation extended for any such additional period; or

(b) The issuing financial institution shall have exercised its right to notify you or the transferee, the account party, and ourselves, of its election not to extend the expiration date of the Letter of Credit.

5. This confirmation is subject to the Uniform Customs and Practice (UCP) for Documentary Credits, 1993 Revision, International Chamber of Commerce Publication No. 500, and to the extent not inconsistent therewith, to the laws of \_\_\_\_\_ (state of confirming financial institution).

6. If this confirmation expires during an interruption of business of this financial institution as described in Article 17 of the UCP, we specifically agree to effect payment if this credit is drawn against within 30 days after the resumption of our business.

Sincerely,

(Confirming financial institution)

(g) The following format shall be used by the Contracting Officer for a sight draft to draw on the Letter of Credit:

SIGHT DRAFT

\_\_\_\_\_  
(City, State)

\_\_\_\_\_, 19\_\_\_\_

\_\_\_\_\_  
(Name and address of financial institution)

Pay to the order of \_\_\_\_\_

(Beneficiary Agency)

the sum of United States \$ \_\_\_\_\_

This draft is drawn under \_\_\_\_\_

Irrevocable Letter of Credit No. \_\_\_\_\_

By: \_\_\_\_\_

(Beneficiary Agency)

(End of clause)

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

Contract price means the award price of the contract or, for requirements contracts, the price payable for the estimated quantity; or for indefinite-delivery type contracts, the price payable for the specified minimum quantity.

(b) Unless the resulting contract price is \$100,000 or less, the successful offeror shall be required to furnish performance and payment bonds to the Contracting Officer as follows:

(1) Performance Bonds (Standard Form 25):

(i) The penal amount of performance bonds shall be 100 percent of the original contract price.

(ii) The Government may require additional performance bond protection when the contract price is increased. The increase in protection shall generally equal 100 percent of the increase in contract price.

(iii) The Government may secure additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.

(2) Payment Bonds (Standard Form 25-A):

(i) The penal amount of payment bonds shall equal--

(A) 50 percent of the contract price if the contract price is not more than \$1 million;

(B) 40 percent of the contract price if the contract price is more than \$1 million but not more than \$5 million; or

(C) \$2.5 million if the contract price is more than \$5 million.

(ii) If the original contract price is \$5 million or less, the Government may require additional protection if the contract price is increased. The penal amount of the total protection shall meet the requirement of subparagraph (b)(2)(i) of this clause.

(iii) The Government may secure additional protection by directing the Contractor to increase the penal sum of the existing bond or to obtain an additional bond.

(c) The Contractor shall furnish all executed bonds, including any necessary reinsurance agreements, to the Contracting Officer, within the time period specified in the Bid Guarantee provision of the solicitation, or otherwise specified by the Contracting Officer, but in any event, before starting work.

(d) The bonds shall be in the form of firm commitment, supported by corporate sureties whose names appear on the list contained in Treasury Department Circular 570, individual sureties, or by other acceptable security such as postal money order, certified check, cashier's check, irrevocable letter of credit, or, in accordance with Treasury Department regulations, certain bonds or notes of the United States. Treasury Circular 570 is published in the Federal Register, or may be obtained from the U.S. Department of Treasury, Financial Management Service, Surety Bond Branch, 401 14th Street, NW., 2nd Floor, West Wing, Washington, DC 20227.

(End of clause)

50 52.229-3 FEDERAL, STATE, AND LOCAL TAXES (JAN 1991)

(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 exceeds \$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)

51      52.232-5      PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (MAY 1997)

(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 total amount of 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;

(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 8th day after 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 amounts. 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)

52 52.232-17 INTEREST (JUN 1996)

(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)

53      52.232-23      ASSIGNMENT OF CLAIMS (JAN 1986)

(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 its 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.

(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)

54      52.232-27      PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS (JUN 1997)

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 the date of an electronic funds transfer. Definitions of pertinent terms are set forth in section 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 that 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. 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 the 30th day after the date of 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 proper 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 the 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 paragraphs (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 may 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 will 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 from such date 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 paragraph (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 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 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 also shall 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) 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 must be postmarked on or before the 40th day after payment was made, except that--

(1) If the postmark 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 interest penalty, 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 accrued in the absence of these limits, subject to the overall limits on the additional penalty specified in subdivision (a)(6)(iii)(A) of this 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 payments 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 that 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 that 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 is 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 obligation to pay an interest penalty.

(3) Subcontractor 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 the 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 a 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 paragraph (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)

55 52.233-1 DISPUTES (DEC 1998)

(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) The Contractor shall provide the certification specified in paragraph (d)(2)(iii) of this clause when submitting any claim exceeding \$100,000.

(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 alternative dispute resolution (ADR). If the Contractor refuses an offer for ADR, the Contractor shall inform the Contracting Officer, in writing, of the Contractor's specific reasons for rejecting the offer.

(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 certifications, as defined in (FAR) 48 CFR 33.201, interest shall be paid from the date that the Contracting Officer initially receives the claim. Simple interest on claims 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)

(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 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)

57 52.236-2 DIFFERING SITE CONDITIONS (APR 1984)

(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 (a) above 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)

58      52.236-3            SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)

(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 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 which 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)

59      52.236-5            MATERIAL AND WORKMANSHIP (APR 1984)

(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 full 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 charges prepaid. Machinery, equipment, material, and articles that do 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)  
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60 52.236-6 SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)

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 work site a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

(End of clause)

61 52.236-7 PERMITS AND RESPONSIBILITIES (NOV 1991)

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)

62 52.236-8 OTHER CONTRACTS (APR 1984)

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)

63      52.236-9            PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT,  
   UTILITIES, AND IMPROVEMENTS (APR 1984)

(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)

64      52.236-10            OPERATIONS AND STORAGE AREAS (APR 1984)

(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)

65 52.236-11 USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)

(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)

66 52.236-12 CLEANING UP (APR 1984)

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)

67 52.236-13 I ACCIDENT PREVENTION (NOV 1991)--ALTERNATE I (NOV 1991)

(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)

68 52.236-15 SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984)

(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 payments 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 deliver 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)

69 52.236-21 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FEB 1997)

(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 the 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)

70 52.236-26 PRECONSTRUCTION CONFERENCE (FEB 1995)

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)

71 52.242-13 BANKRUPTCY (JUL 1995)

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)

72 52.242-14 SUSPENSION OF WORK (APR 1984)

(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)

73 52.243-4 CHANGES (AUG 1987)

(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 of 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 the 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)

74 52.244-6 SUBCONTRACTS FOR COMMERCIAL ITEMS AND COMMERCIAL COMPONENTS (OCT 1998)

(a) Definition.

"Commercial item," as used in this clause, has the meaning contained in the clause at 52.202-1, Definitions.

"Subcontract," as used in this clause, includes a transfer of commercial items between divisions, subsidiaries, or affiliates of the Contractor or subcontractor at any tier.

(b) To the maximum extent practicable, the Contractor shall incorporate, and require its subcontractors at all tiers to incorporate, commercial items or nondevelopmental items as components of items to be supplied under this contract.

(c) Notwithstanding any other clause of this contract, the Contractor is not required to include any FAR provision or clause, other than those listed below to the extent they are applicable and as may be required to establish the reasonableness of prices under Part 15, in a subcontract at any tier for commercial items or commercial components:

(1) 52.222-26, Equal Opportunity (E.O. 11246);

(2) 52.222-35, Affirmative Action for Disabled Veterans and Veterans of the Vietnam Era (38 U.S.C. 4212(a));

(3) 52.222-36, Affirmative Action for Workers with Disabilities (29 U.S.C. 793); and

(4) 52.247-64, Preference for Privately Owned U.S.-Flagged Commercial Vessels (46 U.S.C. 1241) (flow down not required for subcontracts awarded beginning May 1, 1996).

(d) The Contractor shall include the terms of this clause, including this paragraph (d), in subcontracts awarded under this contract.

(End of clause)

75 52.245-2 GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS) (DEC 1989)

(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 this 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 within 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. Repair 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 suit 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, deliver 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)

76 52.245-4 GOVERNMENT-FURNISHED PROPERTY (SHORT FORM) (APR 1984)

(a) The Government shall deliver 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 use, 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, deliver 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)  
(R 7-104.24(f) 1964 NOV)

77 52.246-12 INSPECTION OF CONSTRUCTION (AUG 1996)

(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 completed 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)

78 52.248-3 I VALUE ENGINEERING--CONSTRUCTION (MAR 1989)--ALTERNATE I  
(APR 1984)

(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 prediction 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 decision. 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 and 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)

79 52.249-2 I TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (SEP 1996)--ALTERNATE I (SEP 1996)

(a) The Government may terminate performance of work under this contract in whole or, from time to time, 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 of subcontracts; the approval or ratification will be final for purposes of this clause.

(6) As directed by the Contracting Officer, transfer title and deliver 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 or remaining 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 Contracting Officer fail to agree on the whole amount to be paid the Contractor 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 (1) 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 (1),

respectively, and failed to request a time extension, there is no 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.

(1) 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)

80 52.249-10 DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984)

(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)

81 52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any DoD FAR SUPPLEMENT (48 CFR Chapter 2 ) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

(End of clause)

(NM)

82 52.201-7000 CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991)

(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)

83 52.203-7001 SPECIAL PROHIBITION ON EMPLOYMENT (JUN 1997)

(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 first-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.

(e) 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 identity and relationship of the parties, in all first-tier subcontracts exceeding the simplified acquisition threshold in Part 2 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) 616-3507.

(End of clause)

84 52.203-7002 DISPLAY OF DOD HOTLINE POSTER (DEC 1991)

(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)

85 52.204-7004 REQUIRED CENTRAL CONTRACTOR REGISTRATION (MAR 1998)

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

(1) "Central Contractor Registration (CCR) database" means the primary DoD repository for contractor information required for the conduct of business with DoD.

(2) "Data Universal Numbering System (DUNS) number" means the 9-digit number assigned by Dun and Bradstreet Information Services to identify unique business entities.

(3) "Data Universal Numbering System +4 (DUNS+4) number" means the DUNS number assigned by Dun and Bradstreet plus a 4-digit suffix that may be assigned by a parent (controlling) business concern. This 4-digit suffix may be assigned at the discretion of the parent business concern for such purposes as identifying subunits or affiliates of the parent business concern.

(4) "Registered in the CCR database" means that all mandatory information, including the DUNS number or the DUNS+4 number, if applicable, and the corresponding Commercial and Government Entity (CAGE) code, is in the CCR database; the DUNS number and the CAGE code have been validated; and all edits have been successfully completed.

(b)(1) By submission of an offer, the offeror acknowledges the requirement that a prospective awardee must be registered in the CCR database prior to award, during performance, and through final payment of any contract resulting from this solicitation, except for awards to foreign vendors for work to be performed outside the United States.

(2) The offeror shall provide its DUNS or, if applicable, its DUNS+4 number with its offer, which will be used by the Contracting

Officer to verify that the offeror is registered in the CCR database.

(3) Lack of registration in the CCR database will make an offeror ineligible for award.

(4) DoD has established a goal of registering an applicant in the CCR database within 48 hours after receipt of a complete and accurate application via the Internet. However, registration of an applicant submitting an application through a method other than the Internet may take up to 30 days. Therefore, offerors that are not registered should consider applying for registration immediately upon receipt of this solicitation.

(c) The Contractor is responsible for the accuracy and completeness of the data within the CCR, and for any liability resulting from the Government's reliance on inaccurate or incomplete data. To remain registered in the CCR database after the initial registration, the Contractor is required to confirm on an annual basis that its information in the CCR database is accurate and complete.

(d) Offerors and contractors may obtain information on registration and annual confirmation requirements by calling 1-888-227-2423, or via the Internet at <http://ccr.edi.disa.mil>.

(End of clause)

86 52.219-7003 SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (DoD CONTRACTS) (APR 1996)

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 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 requirements 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-Protege Program established under Section 831 of Pub. L. 101-510, as amended, may count toward its small disadvantaged business goal, subcontracts awarded--

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

(2) Former protege 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)

87 52.223-7001 HAZARD WARNING LABELS (DEC 1991)

(a) "Hazardous material," as used in this clause, is defined in the Hazardous Material Identification and Material Safety Data clause of this contract.

(b) The Contractor shall label the item package (unit container) of any hazardous material to be delivered under this contract in accordance with the Hazard Communication Standard (29 CFR 1910.1200 et seq.). The Standard requires that the hazard warning label conform to the requirements of the standard unless the material is otherwise subject to the labelling requirements of one of the following statutes:

- (1) Federal Insecticide, Fungicide and Rodenticide Act;
- (2) Federal Food, Drug and Cosmetics Act;
- (3) Consumer Product Safety Act;
- (4) Federal Hazardous Substances Act; or
- (5) Federal Alcohol Administration Act.

(c) The Offeror shall list which hazardous material listed in the Hazardous Material Identification and Material Safety Data clause of this contract will be labelled in accordance with one of the Acts in paragraphs (b)(1) through (5) of this clause instead of the Hazard Communication Standard. Any hazardous material not listed will be interpreted to mean that a label is required in accordance with the Hazard Communication Standard.

Material (if none, insert "none.")	Act
_____	_____
_____	_____

(d) The apparently successful Offeror agrees to submit, before award, a copy of the hazard warning label for all hazardous materials not listed in paragraph (c) of this clause. The Offeror shall submit the label with the Material Safety Data Sheet being furnished under the Hazardous Material Identification and Material Safety Data clause of this contract.

(e) The Contractor shall also comply with MIL-STD-129, Marking for Shipment and Storage (including revisions adopted during the term of this contract).

(End of clause)

(a) Definitions.

(1) "Employee in a sensitive position," as used in this clause, means an employee who has been granted access to classified information; or employees in other positions that the Contractor determines involve national security, health or safety, or functions other than the foregoing requiring a high degree of trust and confidence.

(2) "Illegal drugs," as used in this clause, means controlled substances included in Schedules I and II, as defined by section 802(6) of Title 21 of the United States Code, the possession of which is unlawful under Chapter 13 of that Title. The term "illegal drugs" does not mean the use of a controlled substance pursuant to a valid prescription or other uses authorized by law.

(b) The Contractor agrees to institute and maintain a program for achieving the objective of a drug-free work force. While this clause defines criteria for such a program, contractors are encouraged to implement alternative approaches comparable to the criteria in paragraph (c) that are designed to achieve the objectives of this clause.

(c) Contractor programs shall include the following, or appropriate alternatives:

(1) Employee assistance programs emphasizing high level direction, education, counseling, rehabilitation, and coordination with available community resources;

(2) Supervisory training to assist in identifying and addressing illegal drug use by Contractor employees;

(3) Provision for self-referrals as well as supervisory referrals to treatment with maximum respect for individual confidentiality consistent with safety and security issues;

(4) Provision for identifying illegal drug users, including testing on a controlled and carefully monitored basis. Employee drug testing programs shall be established taking account of the following:

(i) The Contractor shall establish a program that provides for testing for the use of illegal drugs by employees in sensitive positions. The extent of and criteria for such testing shall be determined by the Contractor based on considerations that include the nature of the work being performed under the contract, the employee's duties, the efficient use of Contractor resources, and the risks to health, safety, or national security that could result from the failure of an employee adequately to discharge his or her position.

(ii) In addition, the Contractor may establish a program for employee drug testing--

(A) When there is a reasonable suspicion that an employee uses illegal drugs; or

(B) When an employee has been involved in an accident or unsafe practice;

(C) As part of or as a follow-up to counseling or rehabilitation for illegal drug use;

(D) As part of a voluntary employee drug testing program.

(iii) The Contractor may establish a program to test applicants for employment for illegal drug use.

(iv) For the purpose of administering this clause, testing for illegal drugs may be limited to those substances for which testing is prescribed by section 2.1 of Subpart B of the "Mandatory Guidelines for Federal Workplace Drug Testing Programs" (53 FR 11980 (April 11 1988)), issued by the Department of Health and Human Services.

(d) Contractors shall adopt appropriate personnel procedures to deal with employees who are found to be using drugs illegally. Contractors shall not allow any employee to remain on duty or perform in a sensitive position who is found to use illegal drugs until such time as the Contractor, in accordance with procedures established by the Contractor, determines that the employee may perform in such a position.

(e) The provisions of this clause pertaining to drug testing programs shall not apply to the extent they are inconsistent with state or local law, or with an existing collective bargaining agreement; provided that with respect to the latter, the Contractor agrees that those issues that are in conflict will be a subject of negotiation at the next collective bargaining session.

(End of clause)

89 52.227-7033 RIGHTS IN SHOP DRAWINGS (APR 1966)

(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)

90 52.231-7000 SUPPLEMENTAL COST PRINCIPLES (DEC 1991)

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)

91 52.236-7000 MODIFICATION PROPOSALS--PRICE BREAKDOWN (DEC 1991)

(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 an 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)

92 52.243-7001 PRICING OF CONTRACT MODIFICATIONS (DEC 1991)

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)

93 52.0-4000 CONTRACT CLAUSE AND SOLICITATION PROVISION NUMBERING SYSTEM

This document is computer-generated by the Standard Army Automated Contracting System (SAACONS). The numbering system used by the computer for contract clauses and solicitation provisions differs slightly from the procurement regulations but is similar and easily recognizable. The Federal Acquisition Regulation (FAR) uses a numbering system for contract clause and solicitation provisions as follows:

52.2xx-1 and higher (e.g., 52.215-5)

SAACONS uses a 10-digit number in the format of 52.02xx-xxxx. The SAACONS number for the same clause would be 52.0215-0005. FAR contract clauses and solicitation provisions are recognized by a "0" in the 6th digit of the SAACONS number. Department of Defense Federal Acquisition Regulation Supplement (DFARS) contract clauses and solicitation provisions are recognized by a "7" in the 6th digit of the SAACONS number. Army Federal Acquisition Regulation Supplement (AFARS) contract clauses and solicitation provisions are recognized by a "9" in the 6th digit of the SAACONS number. Engineer Federal Acquisition Regulation Supplement (EFARS) contract clauses and solicitation provisions are recognized by a "5" in the 6th digit of the SAACONS number. Local clauses/provisions are identified by three zeros in positions three through five. A summary example of the difference in the numbering systems is as follows:

FAR:	52.227-1	SAACONS:	52.227-0001
DFARS:	252.243-7000	SAACONS:	52.243-7000
AFARS:	52.237-9030	SAACONS:	52.237-9030
EFARS:	52.214-5000	SAACONS:	52.214-5000
LOCAL CLAUSES AND OTHER		SAACONS:	52.000-4001
UPDATED/NEW FAR, DFARS, AFARS, AND EFARS CLAUSES			

END OF SECTION 00700

DRINKWATER PUMPING STATION NO. 2

BIG LAKE BASIN

MISSISSIPPI COUNTY, MISSOURI

SECTION 00800

SPECIAL CONTRACT REQUIREMENTS

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SECTION 00800 - SPECIAL CONTRACT REQUIREMENTS

1.1. COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984). The Contractor shall be required to (a) commence work under this contract within 10 calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than 500 calendar days after the date of receipt by him of notice to proceed. The time stated for completion shall include final cleanup of the premises. (FAR 52.211-10)

1.2. NOT USED.

1.3. LIQUIDATED DAMAGES-CONSTRUCTION (APR 1984).

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 \$540.00 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. (FAR 52.211-12)

1.4. EXCEPTION TO LIQUIDATED DAMAGES. The Contractor's obligations specified in requirements of SECTION 02938 are exempt from liquidated damages.

1.5. CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS (DEC 1991).

a. The Government will provide the Contractor, without charge, a compact disk (CD) containing contract drawings and specifications (except publications incorporated into the technical provisions by reference) and any amendments that were issued.

Drinkwater Pumping Station No. 2  
Big Lake Basin  
Mississippi County, Missouri

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(DFARS 252.236-7001)

1.6. PHYSICAL DATA (APR 1984). Data and information furnished or referred to below are for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

a. The indications of physical conditions on the drawings and in the specifications are the result of site investigations by aerial photographs and topographic surveys.

b. Weather Conditions. Information with respect to temperatures and precipitation may be obtained from the National Weather Service. Also see paragraph 1.28, "Time Extensions for Unusually Severe Weather".

c. Additional Data. Additional data consisting of cross sections, river stage records, records of borings, and boring samples may be available for inspection at the U.S. Army Engineer District, Memphis, Tennessee. (FAR 52.236-4)

1.7 RIGHTS-OF-WAY.

a. The rights-of-way and easements for the work to be constructed under this contract within the limits indicated on the drawings will be provided by the Government without cost to the Contractor. However, the Contractor shall make his own arrangements with the appropriate owners or organizations for transporting his equipment across, over or under railroad tracks, highways, bridges, private property, and utility lines and shall provide at his own expense any additional right-of-way or easements required to effect such crossings, including insurance requirements of owners. Limits of right-of-way which will be provided by the Government are as indicated on the drawings.

b. The Contractor shall, upon reasonable notice, without expense to the Government and at any time during the progress of the work when not being actively used for contract operations, promptly vacate and clean up any part of the Government grounds that have been allotted to or have been in use by him when directed to do so by the Contracting Officer.

c. The Contractor shall not obstruct any existing roads on the lands controlled by the United States except with the permission of the Contracting Officer, and shall maintain such roads in as good condition as exists at the time of commencement of the work.

d. Any additional right-of-way required for access or for the Contractor's method of operation must be obtained by and at the expense of the Contractor. The Contractor shall submit written evidence to the Contracting Officer that he has obtained the rights-of-way from the property owners. The written evidence shall consist of an authenticated copy of the conveyance under which the Contractor acquired the rights-of-way, prepared and executed in accordance with the laws of the State of Missouri. If temporary rights are

obtained by the Contractor, the period of time shall coincide with paragraph 1.1, "Commencement, Prosecution, and Completion of Work", of the SPECIAL CONTRACT REQUIREMENTS, plus a reasonable time for any extension granted for completion of the work. The Contractor shall be solely responsible for any and all damages, claims for damages, and liability of any nature whatsoever arising from or growing out of the use of rights-of-way other than those rights-of-way furnished by the Government.

e. The Contractor shall repair, at his own expense, any and all damage to the existing roads when such damage is a result of his operations on this contract. The Contractor shall also replace, at his own expense, any and all surfacing displaced or damaged by his operations on this contract. The repairs and/or replacement shall be done to the satisfaction of the Contracting Officer.

1.8. LAYOUT OF WORK.

a. The Government will establish the following baselines and bench marks at the site of the work:

- (1) Baselines as shown on the drawings.
- (2) Bench marks as shown on the drawings.

b. From the baselines and bench marks established by the Government, the Contractor shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the work to the location and limit marks prescribed in the specifications or on the contract drawings, subject to such modifications as the Contracting Officer may require to meet changed conditions or as a result of necessary modifications to the contract work.

c. The Contractor shall furnish, at his own expense, such stakes, templates, platforms, equipment, tools and materials, and all labor as may be required in laying out any part of the work from the baselines and bench marks established by the Government. It shall be the responsibility of the Contractor to maintain and preserve all stakes and marks established by the Contracting Officer until authorized to remove them, and if such marks are destroyed, by the Contractor or through his negligence, prior to their authorized removal, they may be replaced by the Contracting Officer, at his discretion, and the expense of replacement will be deducted from any amounts due or to become due the Contractor. The Contracting Officer may require that work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking of the work.

1.9 NOT USED.

1.10. QUANTITY SURVEYS-ALTERNATE I (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 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)

d. Quantity surveys as used in this clause means a topographical survey accomplished by ground methods requiring the use of a total station instrument with the display output recorded and stored in an electronic field book for further calculations in a computer. The Contractor shall furnish the electronic data in an Intergraph or PacSoft format to the Contracting Officer.

e. Quantity Survey Method. The cross-section method shall be used to obtain topography. Cross-section spacing will depend upon the terrain but shall not exceed 100 feet. All breaks in slope shall be recorded along the cross-section with a maximum distance 25 feet between observations.

f. Quantity Survey Limits. After clearing of vegetation and trees, the topographic survey shall extend to 50 feet beyond the limits of work or to the Right-of-Way limits as shown on the drawings.

1.11. PROGRESS CHART. The schedule of work will be in accordance with the progress chart. The progress chart required by provisions of paragraph (a) of the CONTRACT CLAUSE entitled "Schedules for Construction Contracts" shall be prepared on ENG Form 2454, copies of which will be furnished to the Contractor by the Government. THREE COPIES OF THE SCHEDULE WILL BE REQUIRED.

1.12. SAFETY-RELATED SPECIAL REQUIREMENTS. ALL WORK UNDER THIS CONTRACT SHALL COMPLY WITH THE LATEST VERSION OF U.S. ARMY CORPS OF ENGINEERS SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1, AND OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA) STANDARDS IN EFFECT ON THE DATE OF THE SOLICITATION. NO SEPARATE PAYMENT WILL BE MADE FOR COMPLIANCE WITH EM 385-1-1, NOR FOR COMPLIANCE WITH ANY OF THE OTHER SAFETY-RELATED SPECIAL REQUIREMENTS.

a. Accident Investigations and Reporting. Refer to EM 385-1-1, Section 1. Accidents shall be investigated and reports completed by the immediate supervisor of the employee(s) involved and reported to the Contracting Officer or his representative within one working day after the accident occurs.

b. Accident Prevention Program. Refer to the CONTRACT CLAUSE entitled, "Accident Prevention (Alternate I)". Within 21 calendar days after receipt of Notice of Award of the contract, four copies of the Accident Prevention Program shall be submitted to the Contracting Officer for review and approval. The program shall be prepared in the following format:

(1) An executed LMV Form 358R, Administrative Plan (available upon request).

(2) An executed LMV Form 359R, Activity Hazard Analysis (available upon request).

(3) A copy of company policy statement regarding accident prevention.

(4) When marine plant and equipment are in use under a contract, the method of fuel oil transfer shall be submitted on LMV Form 414R, Fuel Oil Transfer, (available upon request). (Refer to 33 CFR 156.)

The Contractor shall not commence physical work at the site until the program has been approved by the Contracting Officer, or his authorized representative. At the Contracting Officer's discretion, the Contractor may submit his Activity Hazard Analysis for only the first phase of construction provided that it is accompanied by an outline of the remaining phases of construction. All remaining phases shall be submitted and accepted prior to the beginning of work in each phase. Also refer to Section 1 of EM 385-1-1.

c. Daily Inspections. The Contractor shall perform daily safety inspections and record them on the forms approved by the Contracting Officer. Reports of daily inspections shall be maintained at the jobsite. The reports shall be records of the daily inspections and resulting actions. Each report will include, as a minimum, the following:

(1) Phase(s) of construction underway during the inspection.

(2) Locations or areas inspections were made.

(3) Results of inspection, including nature of deficiencies observed and corrective actions taken, or to be taken, date, and signature of the person responsible for its contents.

d. Machinery and Mechanized Equipment. Machinery and mechanized equipment used under this contract shall comply with the following:

(1) When mechanized equipment is operated on floating plant,

the Contractor shall provide positive and acceptable means of preventing this equipment from moving or falling into the water. The type of equipment addressed by this clause includes front-end loaders, bulldozers, trucks (both on- and off-road), backhoes, track hoes, and similar equipment. If the Contractor plans to use such equipment on floating plant, an activity hazard analysis must be developed for this feature of work. The plan must include a detailed explanation of the type or types of physical barriers, curbs, structures, etc., which will be incorporated to protect the operator and prevent the equipment from entering the water. Nonstructural warning devices may be considered for situations where the use of structural barriers is determined to be impracticable. The activity hazard analysis must thoroughly address the procedure and be submitted to the Corps for review and acceptance prior to start of this feature of work.

(2) The stability of crawler, truck, and wheel-mounted cranes shall be assured.

(a) The manufacturer's load-rating chart may be used to determine the maximum allowable working load for each particular crane's boom angle provided a test load, with a boom angle of 20 degrees, confirms the manufacturer's load-rating table.

(b) Stability tests are required if:

(i) There is no manufacturer's load-rating chart securely fixed to the operator's cab;

(ii) There has been a change in the boom or other structural members; or

(iii) There has been a change in the counter-weight.

The test shall consist of lifting a load with the boom in the least stable undercarriage position and at an angle of 20 degrees above the horizontal. The test shall be conducted under close supervision on a firm, level surface. The load that tilts the machine shall be identified as the test load. The test load moment (in ft-lbs) shall then be calculated by multiplying the horizontal distance (in ft) from the center of rotation of the machine to the test load, times the test load (in lbs). Three-fourths of this test-load moment shall then be used to compute the maximum allowable operating loads for the boom at 20, 40, 60, and 80 degrees above horizontal. From these maximum allowable operating loads, a curve shall be plotted and posted in the cab of the machine in sight of the operator. These values shall not be exceeded except in the performance test described below. The test load shall never exceed 110 percent of the manufacturer's maximum rated capacity.

(c) In lieu of the test and computations above, the crane may be load tested for stability at each of the four boom positions listed above.

(3) Performance tests shall be performed in accordance with Section 16 of EM 385-1-1. Performance tests shall be conducted after each

stability test, when the crane is placed in service on a project, and at least every 12 months.

(4) Inspections shall be made which will ensure a safe and economical operation of both cranes and draglines. Specific inspections and their frequencies are listed on the appropriate checklists noted below. Results of inspections and tests for cranes shall be recorded on the Safety Inspection Check List, LMV Form 326R (available upon request), and inspection results for draglines shall be recorded on LMV Form 373R (available upon request). Copies of the inspections and tests shall be available at the jobsite for review. All stability and performance tests on cranes and all complete dragline inspections shall be witnessed by the Contracting Officer or his authorized representative.

(5) A complete dragline inspection shall be made:

(a) At least annually;

(b) Prior to the dragline being placed in operation;  
and

(c) After the dragline has been out of service for more than six months.

e. Safety Sign. The Contractor shall furnish, erect, and maintain a safety sign at the site, as located by the Contracting Officer. The sign shall conform to the requirements of this paragraph and the drawing entitled "Safety Sign", included at the end of these Special Contract Requirements. The lettering shall be black and the background white. When placed on floating plant, the sign may be half size. Upon request, the Government will furnish a decal of the Engineer Castle. The sign shall be erected as soon as practicable, but not later than 15 calendar days after the date established for commencement of work. The data required shall be current.

1.13. BASIS FOR SETTLEMENT OF PROPOSALS (JAN 1997). Actual costs will be used to determine equipment costs for a settlement proposal submitted on the total cost basis under FAR 49.206-2(b). In evaluating a terminations settlement proposal using the total cost basis, the following principles will be applied to determine allowable equipment costs:

(1) Actual costs for each piece of equipment, or groups of similar serial or series equipment, need not be available in the Contractor's accounting records to determine total actual equipment costs.

(2) If equipment costs have been allocated to a contract using predetermined rates, those charges will be adjusted to actual costs.

(3) Recorded job costs adjusted for unallowable expenses will be used to determine equipment operating expenses.

(4) Ownership costs (depreciation) will be determined using the Contractor's depreciation schedule (subject to the provisions of FAR 31.205-11).

(5) License, taxes, storage and insurance costs are normally recovered as an indirect expense and unless the Contractor charges these costs directly to contracts, they will be recovered through the indirect expense rate. (EFARS 52.249-5000)

1.14. CERTIFICATES OF COMPLIANCE. Any certificates required for demonstrating proof of compliance of material with specification requirements shall be executed in four (4) copies. Each certificate shall be signed by an official authorized to certify on 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 test 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.

1.15. CONTRACTOR'S CERTIFICATE. Each submittal of shop drawings and materials data shall be accompanied by a certificate, signed by the head of the Quality Control Organization of the prime Contractor, that the prime Contractor has reviewed in detail all shop drawings and materials contained in the submittal and that they are correct and in strict conformance with the contract drawings and specifications except as may be otherwise explicitly stated. The Government will first check for the Contractor's certificate and then review and render approval action or indicate disapproval in those cases where contract requirements are not fulfilled.

1.16. SHOP DRAWINGS. The Contractor shall submit to the Contracting Officer for approval 6 copies of all shop drawings as called for under the various headings of these specifications. These drawings shall be complete and detailed. If approved by the Contracting Officer, each copy of the drawings will be identified as having received such approval by being so stamped and dated. The Contractor shall make any correction required by the Contracting Officer. If the Contractor considers any correction indicated on the drawings to constitute a change to the contract drawings or specifications, notice as required under the CONTRACT CLAUSE entitled "Changes", will be given to the Contracting Officer. Five sets of all shop drawings will be retained by the Contracting Officer and one set will be returned to the Contractor. The approval of the drawings by the Contracting Officer shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the Contractor of the responsibility for any errors which may exist as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.

1.17. AS-BUILT DRAWINGS. The Contractor shall maintain two (2) full-size sets of the Contract drawings depicting a current record of the work as actually constructed. One set is for the Contractor's use and one for the Government's use. These working as-built drawing red-line mark-ups may be manually or electronically generated using the construction plans. These working as-built drawings shall be reviewed at least monthly with the Contracting Officer, prior

to the Contractor submitting a request for progress payment. Both shall certify that the as-built drawings are accurate and up-to-date before progress payment is made. Upon completion of the work and not later than 60 days from acceptance, the Contractor shall deliver a complete final set of the as-built red-line marked-up plans depicting the construction as actually accomplished. The final as-built drawings shall be identified as such by marking or stamping them with the words "AS-BUILT DRAWINGS" in letters at least 3/16" high. Those drawings where no change is involved shall be marked or stamped "AS-BUILT, NO CHANGE". Compliance and delivery of the final as-built drawings will be enforced through the approval of final payment. Also, the quality of the final as-built drawings will be reflected in the Contractor's performance evaluation.

1.18. DAMAGE TO WORK. The responsibility for damage to any part of the permanent work shall be as set forth in the CONTRACT CLAUSE entitled "Permits and Responsibilities". However, if, in the judgement of the Contracting Officer, any part of the permanent work performed by the Contractor is damaged by flood, tornado, or earthquake, which damage is not due to the failure of the Contractor to take reasonable precautions or to exercise sound engineering and construction practices in the conduct of the work, the Contractor shall make the repairs as ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If, in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such work, an equitable adjustment pursuant to the CONTRACT CLAUSE entitled "Changes" will be made as full compensation for the repairs of that part of the permanent work for which there are no applicable contract unit or lump sum prices. Except as herein provided, damage to all work (including temporary construction), utilities, materials, equipment and plant shall be repaired to the satisfaction of the Contracting Officer at the Contractor's expense regardless of the cause of such damage.

1.19. NOTIFICATION OF AREA ENGINEER BEFORE BEGINNING WORK. At least 7 days before beginning work, the Contractor shall notify Mr. Steven P. Shankle, Area Engineer, Caruthersville Area Office, 706 Harry S. Truman Boulevard, Caruthersville, Missouri 63830-1268, Telephone No. 901-544-3074 or 573-333-1043.  
COLLECT CALLS WILL NOT BE ACCEPTED.

1.20. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE (MAR 1995).

a. This clause does not apply to terminations. See SPECIAL CONTRACT REQUIREMENT entitled, "Basis for Settlement of Proposals" and FAR Part 49.

b. 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 for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the Contractor's accounting records. When both ownership and operating costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the Contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, Region V. 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 retroactive pricing, the schedule in effect at the time the work was performed shall apply.

c. Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(2)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-lease-back arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.

d. When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the Contracting Officer shall request the Contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Proposal Cover Sheet. (EFARS 52.231-5000)

NOTE: THE CONTRACTOR MAY PURCHASE THE EQUIPMENT MANUAL FROM THE GOVERNMENT PRINTING OFFICE. THE GOVERNMENT PRINTING OFFICE TELEPHONE NO. IS 202-512-1800.

1.21. RETESTING OF CONSTRUCTION MATERIALS. Unless otherwise specified, where the Technical Specifications state that tests will be performed at the expense of the Government, the cost of only the initial test will be borne by the Government. Any retesting due to failure of the materials to meet the requirements in the initial test or any retesting requested by the Contractor shall be performed at the Contractor's expense. The retests shall be at laboratories approved by the Contracting Officer. The costs of retests made at Government laboratories will be deducted from the total amount due the Contractor.

1.22. VEHICLE WEIGHT LIMITATIONS. Vehicle weight limitations for operation on roads, streets, and bridges may affect the prosecution of work under this contract. The Contractor will be responsible for obtaining all necessary licenses and permits in accordance with the CONTRACT CLAUSE entitled "Permits and Responsibilities".

1.23. OBSTRUCTIONS. The Contractor shall make his own arrangements with owners of utility lines located within the right-of-way for the rerouting or altering of power and communication lines as may be necessary to provide clearance for the construction of the work under this contract, and for the replacement of the lines in their permanent location after the completion of the work adjacent thereto. No separate payment as such will be made for the alteration of these utility lines and the costs in connection therewith shall be considered as an incidental expense to the Contractor. The Contractor shall exercise special care when working in the vicinity of utility lines to prevent damage thereto or injury to the Contractor's employees or others.

1.24. NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES). In compliance with the General Permit of the NPDES, the Contracting Officer will file a Notice of Intent (NOI) with the State of Missouri. The Contractor shall adhere strictly to the erosion control provisions of Section 01130 - ENVIRONMENTAL PROTECTION to minimize sediment discharge into nearby water courses to the maximum extent practicable.

1.25. PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984). The Contractor shall perform on the site, and with its own organization, work equivalent to at least fifteen (15) 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)

1.26. CONTINUING CONTRACTS (MAR 1995).

a. This is a continuing contract, as authorized by Section 10 of the River and Harbor Act of September 22, 1922 (33 U.S. Code 621). The payment of some portion of the contract price is dependent upon reservations of funds from future appropriations, and from future contribution to the project having one or more non-federal project sponsors. The responsibilities of the Government are limited by this clause notwithstanding any contrary provision of the "Payments Under Fixed-Price Construction Contracts" clause or any other clause of this contract.

b. The sum of \$ 250,000 has been reserved for this contract and is available for payments to the Contractor during the current fiscal year. It is expected that Congress will make appropriations for future fiscal years from which additional funds together with funds provided by one or more non-federal project sponsors will be reserved for this contract.

c. Failure to make payments in excess of the amount currently reserved, or that may be reserved from time to time, shall not entitle the Contractor to a price adjustment under the terms of this contract except as specifically provided in paragraphs "f" and "i" below. No such failure shall constitute a breach of this contract, except that this provision shall not bar a breach-of-contract action if an amount finally determined to be due as a termination allowance remains unpaid for one year due solely to a failure to reserve sufficient additional funds therefor.

d. The Government may at any time reserve additional funds for payments under the contract if there are funds available for such purpose. The Contracting Officer will promptly notify the Contractor of any additional funds reserved for the contract by issuing an administrative modification to the contract.

e. If earnings will be such that funds reserved for the contract will be exhausted before the end of any fiscal year, the Contractor shall give written notice to the Contracting Officer of the estimated date of exhaustion and the amount of additional funds which will be needed to meet payments due or to become due under the contract during that fiscal year. This notice shall be

given not less than 45 nor more than 60 days prior to the estimated date of exhaustion.

f. No payments will be made after exhaustion of funds except to the extent that additional funds are reserved for the contract. The Contractor shall be entitled to simple interest on any payment that the Contracting Officer determines was actually earned under the terms of the contract and would have been made except for exhaustion of funds. Interest shall be computed from the time such payment would otherwise have been made until actually or constructively made, and shall be at the rate established by the Secretary of the Treasury pursuant to Public Law 92-41, 85 STAT 97, as in effect on the first day of the delay in such payment.

g. Any suspension, delay, or interruption of work arising from exhaustion or anticipated exhaustion of funds shall not constitute a breach of this contract and shall not entitle the Contractor to any price adjustment under the "Suspension of Work" clause or in any other manner under this contract.

h. An equitable adjustment in performance time shall be made for any increase in the time required for performance of any part of the work arising from exhaustion of funds or the reasonable anticipation of exhaustion of funds.

i. If, upon the expiration of sixty (60) days after the beginning of the fiscal year following an exhaustion of funds, the Government has failed to reserve sufficient additional funds to cover payments otherwise due, the Contractor, by written notice delivered to the Contracting Officer at any time before such additional funds are reserved, may elect to treat his right to proceed with the work as having been terminated. Such a termination shall be considered a termination for the convenience of the Government.

j. If at any time it becomes apparent that the funds reserved for any fiscal year are in excess of the funds required to meet all payments due or to become due the Contractor because of work performed and to be performed under the contract during the fiscal year, the Government reserves the right, after notice to the Contractor, to reduce said reservation by the amount of such excess. (EFARS 52.232-5001)

1.27 NOT USED.

1.28. TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER (31 OCT 1989).

a. 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:

(1) 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.

(2) 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.

b. 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

<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>
(11)	(8)	(4)	(2)	(2)	(2)	(2)	(1)	(2)	(2)	(4)	(9)

c. 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 b, above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the CONTRACT CLAUSE entitled "Default (Fixed-Price Construction)". (ER 415-1-15, Appendix A)

1.29. PAYMENT FOR MOBILIZATION AND DEMOBILIZATION (DEC 1991).

a. The Government will pay all costs for the mobilization and demobilization of all of the Contractor's plant and equipment at the contract lump sum price for this item.

(1) Sixty (60) percent of the lump sum price upon completion of the Contractor's mobilization at the work site.

(2) The remaining forty (40) percent upon completion of demobilization.

b. The Contracting Officer may require the Contractor to furnish cost data to justify this portion of the bid if the Contracting Officer believes that the percentages in paragraphs a(1) and (2) of this clause do not bear a reasonable relation to the cost of the work in this contract.

(1) Failure to justify such price to the satisfaction of the Contracting Officer will result in payment, as determined by the Contracting Officer, of--

(i) Actual mobilization costs at completion of mobilization;

(ii) Actual demobilization costs at completion of demobilization; and

(iii) The remainder of this item in the final payment under this contract.

(2) The Contracting Officer's determination of the actual costs in paragraph b(1) of this clause is not subject to appeal. (DFARS 252.236-7004)

1.30. STONE SOURCES.

a. Stone meeting the requirements of these specifications has been produced from the sources listed below:

<u>Name of Firm</u>	<u>Name of Quarry</u>	<u>Location</u>	<u>Certification Date</u>
Brickeys Stone, LLC	Old Menefee	Bloomsdale, MO	1997
Martin Marietta Aggregates	Three Rivers	Smithland, KY	1996
Meridian Aggregate Co.	Valley Stone	Black Rock, AR	1995
Pine Bluff Sand and Gravel Co.	River Mountain	Delaware, AR	1996
Seminole Ag-Lime Co.	Seminole	Dexter, MO	1996
Tower Rock Stone Co.	Bussen	Ste. Genevieve, MO	1995
Tower Rock Stone Co.	Gray's Point	Scott City, MO	1995
Vulcan Materials Co.	Gilbertsville	Lake City, KY	1996
Vulcan Materials Co.	Parsons	Parsons, TN	1996
Vulcan Materials Co.	Verkler	Black Rock, AR	1996

b. Stone may be furnished either from any of the listed sources or from any other sources designated by the Contractor and accepted by the Contracting Officer, subject to the conditions hereinafter stated.

c. After the award of the contract, the Contractor shall designate in writing only one source or one combination of sources from which he proposes to furnish stone. If the Contractor proposes to furnish stone from a source or sources not listed above, he may designate only a single source for stone. Samples for acceptance testing shall be provided as required in the Technical Specifications. If a source for stone so designated by the Contractor is not accepted by the Contracting Officer for use, the Contractor may not propose other sources but shall furnish the stone from a listed source at no additional cost to the Government.

d. Acceptance of a source of stone shall not be construed as acceptance of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels, when such materials are unsuitable for stone as determined by the Contracting Officer. Materials produced from a listed source shall meet all the requirements of the Technical Specifications.

1.31. FIELD OFFICE BUILDING.

a. The Contractor shall furnish and maintain a temporary building for the exclusive use of the Government inspectors during the life of the contract. The building shall conform to the following requirements:

Floor Space	Not less than 500 sq. ft.
Height of Ceiling	Not less than 7 feet
Windows	Not less than 4
Doors	At least 1
Type of Floor	Wood or Concrete

The building shall be of light but weatherproof construction. Windows shall be arranged to open and to be fastened from the inside. All door and window openings shall be provided with suitable screens. The door shall be equipped with a durable hasp and padlock. Interior surfaces of exterior walls and ceilings shall be covered with insulating board and an inside storage room of adequate size shall be provided. The Contractor shall furnish an adequate supply of approved drinking water, sufficient electrical outlets for office calculators and equipment, running water for a toilet facility having a flushable toilet and for a sink, all electricity required and sufficient fixtures for adequate lighting, and during cold weather shall furnish adequate heat. The office shall be equipped with at least five chairs, drawing table, and two desks. The field office, its location and all facilities shall be subject to the approval of the Contracting Officer. The building shall also be equipped with air conditioning during hot weather. The Contractor shall have the field office building thoroughly cleaned at least once a week.

b. No separate payment will be made for furnishing and maintaining the field office. Such building will remain the property of the Contractor and shall be removed upon completion of the work as provided in the CONTRACT CLAUSE entitled "Operations and Storage Areas".

1.32 THRU 1.33 NOT USED

1.34. HAUL ROADS. Whenever practical, one-way haul roads shall be used on this contract. Haul roads built and maintained for this work shall comply with the following:

a. One-way haul roads for off-the-road equipment; e.g., belly dumps, scrapers, and off-the-road trucks shall have a minimum usable width of 25 feet. One-way haul roads for over-the-road haulage equipment only (e.g., dump trucks, etc.) may be reduced to a usable width of 15 feet. When the Contracting Officer determines that it is impractical to obtain the required width for one-way haul roads (e.g., a road on top of a levee), a usable width of not less than 10 feet may be approved by the Contracting Officer, provided a positive means of traffic control is implemented. Such positive means shall be signs, signals, and/or signalman, and an effective means of speed control.

b. Two-way haul roads for off-the-road haulage equipment shall have a usable width of 60 feet. Two-way haul roads for over-the-road haulage equipment

only may be reduced to a usable width of 30 feet.

c. Haul roads shall be graded and otherwise maintained to keep the surface free from potholes, ruts, and similar conditions that could result in unsafe operation.

d. Grades and curves shall allow a minimum sight distance of 200 feet for one-way roads and 300 feet for two-way roads. Sight distance is defined as the centerline distance an equipment operator (4.5 feet above the road surface) can see an object 4.5 feet above the road surface. When conditions make it impractical to obtain the required sight distance (e.g., ramps over levees), a positive means of traffic control shall be implemented.

e. Dust abatement shall permit observation of objects on the roadway at a minimum distance of 300 feet.

f. Haul roads shall have the edges of the usable portion marked with posts at intervals of 50 feet on curves and 200 feet maximum elsewhere. Such markers shall extend 6 feet above the road surface and for nighttime haulage be provided with reflectors in both directions.

1.35. TEMPORARY PROJECT FENCING. Temporary project fencing as required by Paragraph 04.A.04 of EM 385-1-1 is not required on this project.

1.36. MAINTENANCE OF TRAFFIC. The Contractor shall maintain traffic over existing roads and bridges in the vicinity of the new Drinkwater Pumping Station until it is constructed. The Contractor shall erect and maintain such signs and barricades as the Contracting Officer deems appropriate for the protection of the traveling public.

1.37 THRU 1.38 NOT USED

1.39. SUNDAY, HOLIDAY AND NIGHT WORK. Sunday and Holiday work will be at the option of the Contractor, but night work will not be permitted unless otherwise authorized by the Contracting Officer.

1.40 THRU 1.41 NOT USED

1.42. STORAGE OF EQUIPMENT AND MATERIALS. Storage of the Contractor's equipment and materials shall be at those areas within the rights-of-way designated by the Contracting Officer.

1.43. WARRANTY OF CONSTRUCTION (MAR 1994).

a. In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph i. of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of--

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

e. The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

(3) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

h. In the event the Contractor's warranty under paragraph (b) of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

i. Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished

material or design.

j. This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud. (FAR 52.246-21)

1.44. UTILITIES. All utilities located at the site are to remain in place and operative during the construction. The Contractor shall exercise special care when working in the vicinity of the utilities to prevent damage thereto or injury to the Contractor's employees or others. Any damage to the utilities or interruptions of service occasioned by the Contractor's operations shall be repaired and the service restored promptly at his expense.

1.45. AVAILABILITY AND USE OF UTILITY SERVICES. The Contractor shall provide at the site for all work under this contract, the necessary utility services needed for completion of work under this contract.

1.46. COMMERCIAL WARRANTY. The Contractor agrees that the building and construction materials and building hardware furnished under this contract shall be covered by the most favorable commercial warranty the Contractor gives to any customer for such products and that the rights and remedies provided herein are in addition to and do not limit any rights afforded to the Government by any other clause of this contract. The warranty will take effect immediately after compliance by the Contractor of these specifications, and acceptance of the completed work by the Government.

1.47. ELECTRICITY. All electric current required by the Contractor shall be furnished at his own expense. All temporary connections for electricity shall be subject to the approval of the Contracting Officer. All temporary lines shall be furnished, installed, connected and maintained by the Contractor in a workman-like manner satisfactory to the Contracting Officer, and shall be removed by the Contractor in like manner at his expense prior to completion of the construction.

1.48. PAYMENT FOR MATERIAL STORED OFFSITE.

a. In the preparation of monthly progress payment estimates, the Contracting Officer, upon request from the Contractor and in compliance with other criteria as hereinafter stated, will authorize payment, subject to availability of funds, for materials delivered to the Contractor at locations other than the site for the following items:

b. The following criteria must be satisfied before the prescribed payment will be approved.

(1) The Contractor shall furnish written evidence that he holds title to the material.

(2) The Contractor shall furnish evidence of the value of the materials.

(3) The materials shall have prior approval for incorporation into the work, i.e., required shop drawings, certificates of compliance, etc., must have been submitted and final approval action taken.

(4) The materials must be properly stored to the satisfaction of the Contracting Officer.

c. Other materials having a value exceeding \$5,000.00 and delivered to the Contractor at locations other than the site may be considered for payment at the sole discretion of the Contracting Officer.

1.49 THRU 1.53 NOT USED

1.54. FLOOD EMERGENCY.

a. In the event that a threat of flood is considered to exist or to be impending during work under this contract, the Contractor, if ordered, shall perform emergency operations as directed in order to place the pumping plant into operation, and an equitable adjustment in the contract price will be made in accordance with the CONTRACT CLAUSE entitled "Changes" on account of the additional work required.

b. Should the Contractor, after specific notification by the Contracting Officer that a flood emergency is considered to exist, or to be impending, fail to complete, without delay, the emergency operations as specified in paragraph a above, or should the flood emergency be of such nature that, in the opinion of the Contracting Officer, the Contractor is unable to complete the required emergency operations in time to place the pumping plant into operation by the time it is needed, the Contracting Officer shall have the right to prescribe the location and the order of work by the Contractor for the duration of the flood emergency and to employ the necessary equipment and perform all or any part of such work or to cause all or any part of such work to be performed by others. No payment will be made to the Contractor for any work by the Contracting Officer or by others under the terms of this subparagraph or for added expense to the Contractor occasioned by construction difficulties arising from operations of the Contracting Officer or others under the terms of this subparagraph.

c. The right is reserved by the Contracting Officer to suspend the Contractor's operations for such period or periods of time during threat of impending flood or flood emergency as may be necessary. Intervals during which work is suspended by order of the Contracting Officer under the provisions of this subparagraph will not be counted as part of the contract period.

1.55. PATENTS, PROPRIETARY RIGHTS.

a. The Contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this contract of which the Contractor has knowledge.

b. In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed hereunder, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.

1.56. PROTECTION OF MATERIALS AND WORK. The Contractor shall at all times protect and preserve all materials, supplies, and equipment of every description (including property which may be Government-furnished or owned) and all work performed. All reasonable requests of the Contracting Officer to enclose or specially protect such property shall be complied with. If, as determined by the Contracting Officer, material, equipment, supplies, and work performed are not adequately protected by the Contractor, such property may be protected by the Government and the cost thereof may be charged to the Contractor or deducted from any payments due to him.

1.57. EXISTING FLOOD PROTECTION. The Contractor shall conduct the construction of all work under this contract in such manner that existing flood protection within the limits of the existing embankments is maintained at all times. The embankments shall not be disturbed except as necessary to perform the work. When the work under this contract is completed, flood protection within such areas shall be at least equal to that existing before start of construction.

1.58 THRU 1.62 NOT USED

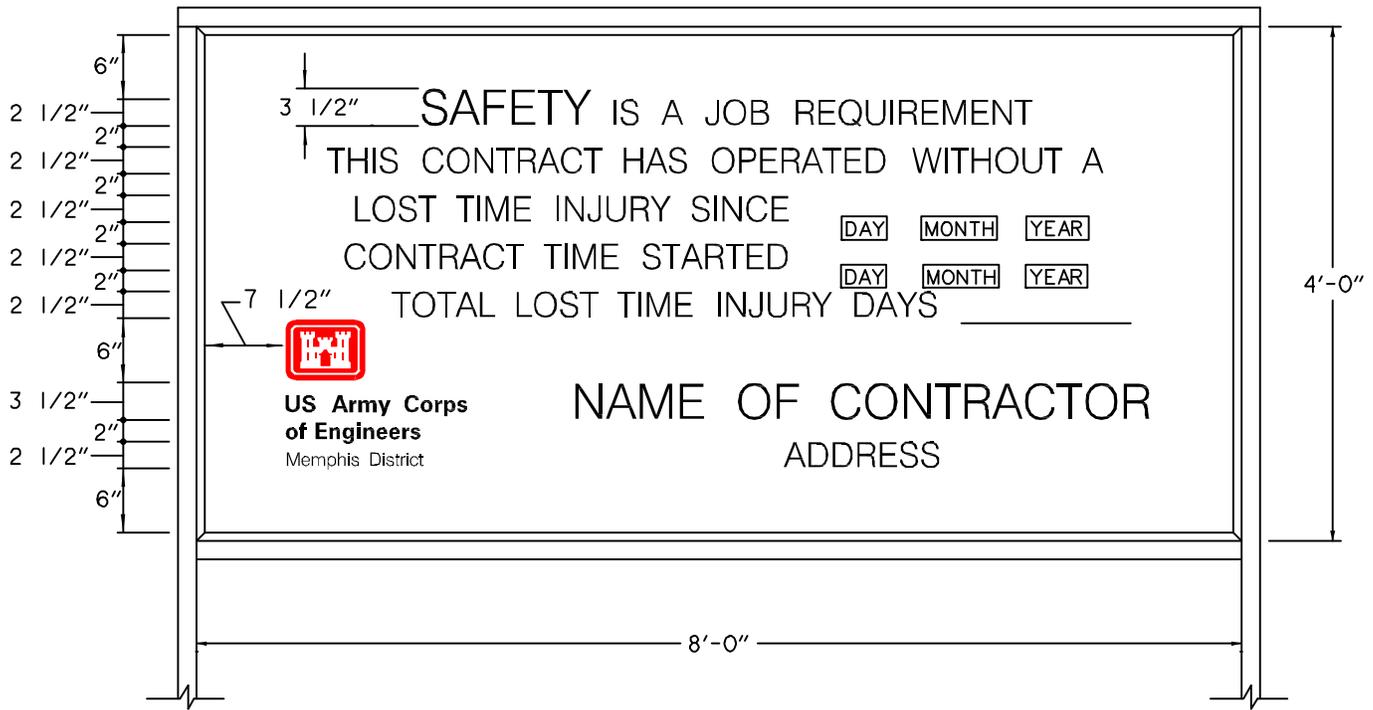
1.63. DESIGNATED BILLING OFFICE. The designated billing office for this contract shall be Caruthersville Area Office, 706 Harry S. Truman Blvd, Caruthersville, Missouri 63830-1268.

1.64 YEAR 2000 COMPLIANCE. In accordance with FAR 39.106, the Contractor shall ensure that with respect to any design, construction, goods, or services under this contract as well as any subsequent task/delivery orders issued under this contract (if applicable), all information technology contained therein shall be year 2000 compliant. Specifically the Contractor shall:

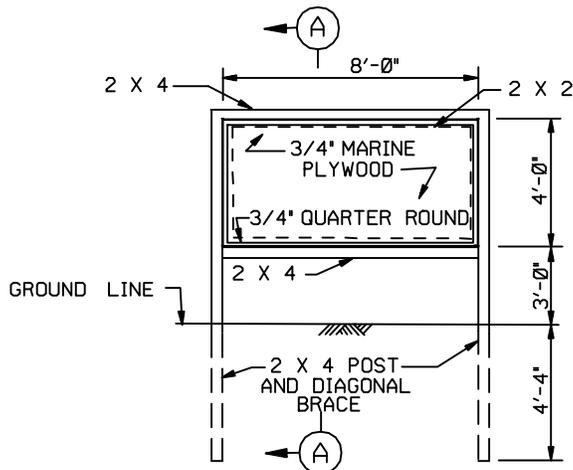
a. Perform, maintain, and provide an inventory of all major components to include structures, equipment, items, parts, and furnishings under this contract and each task/delivery order which may be affected by the Y2K compliance requirement.

b. Indicate whether each component is currently Year 2000 compliant or requires an upgrade for compliance prior to Government acceptance.

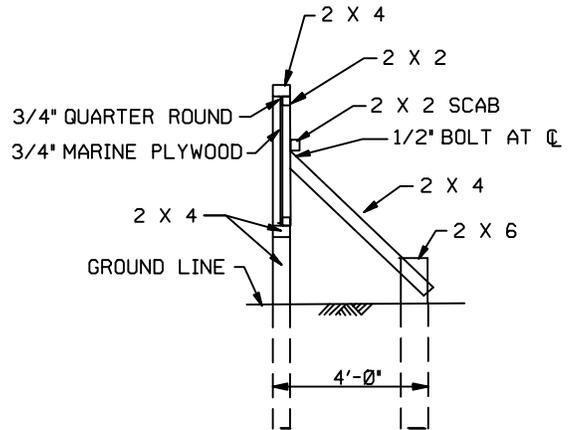
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ELEVATION



ELEVATION



SECTION A-A

NOTES:

1. CONTRACTOR SHALL CONSTRUCT AND MAINTAIN A DURABLE SIGN AS SHOWN.
2. WOOD IN CONTACT WITH GROUND SHALL BE TREATED LUMBER.
3. ALL EXPOSED SURFACES SHALL BE WHITE HOUSE PAINT.
4. LETTERING SHALL BE BLACK.
5. ENGINEER CASTLE DECAL FURNISHED BY GOVERNMENT.
6. 22 GA. SHEET METAL MAY BE USED IN LIEU OF PLYWOOD.



**US Army Corps  
of Engineers**

Memphis District

ENGINEER CASTLE DETAIL

SCALE: NONE

MARCH 1995

U.S. ARMY ENGINEER DISTRICT, MEMPHIS  
CORPS OF ENGINEERS  
MEMPHIS, TENNESSEE

SAFETY SIGN

**TECHNICAL  
SPECIFICATIONS**

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01025

MEASUREMENT AND PAYMENT

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 LUMP SUM PAYMENT ITEMS

1.1.1 General

Payment items for the work of this contract for which contract lump sum payments will be made are listed in the BIDDING SCHEDULE and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environment protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.1.2 Lump Sum Items

(1) "Mobilization and Demobilization"

a. Payment

Payment will be made for costs associated with "Mobilization and Demobilization", as defined in SECTION 00800, paragraph 1.29.

b. Unit of measure, job: JB.

(2) "Environmental Protection"

a. Payment

Payment will be made for costs associated with operations necessary for "Environmental Protection" as specified in Section 01130.

b. Unit of measure, job: JB.

(3) "Dewatering"

a. Payment

Payment for dewatering will be made at the applicable contract lump sum price for "Dewatering". The price and payment shall constitute full compensation for furnishing all plant, labor, material, and equipment; designing, furnishing, installing, maintaining, operating and removing the dewatering facilities; maintaining, operating and removing the dewatering facilities; maintaining the dewatered area; and all work incidental thereto including construction of dikes, ditches, drains, sumps, wells, pumps, piezometers, removal of wells, piezometers, plugging holes, maintaining protection dikes and closure dams, and all other work which may be necessary to accomplish the specified dewatering results and which is not specified to be paid for separately.

Fifty percent (50%) of the lump sum price will be paid when installation of the dewatering system has been completed, tested, evaluated and the piezometric level of the ground water has been lowered to 5 feet below the bottom of the excavation and at least 2 feet below the side slopes.

Forty percent (40%) of the lump sum price will be prorated on the basis of the estimated number of months that dewatering will be required and will be paid monthly.

The remaining 10 percent (10%) of the lump sum price will be paid when the dewatering system has been removed as required herein and cleanup in connection therewith has been completed.

b. Unit of Measure, job: JB

(4) "Clearing and Grubbing"

a. Payment

Payment for "Clearing and Grubbing" will be made at the contract lump sum price for "Clearing and Grubbing", which price and payment shall constitute full compensation for "Clearing and Grubbing", disposal of cleared and grubbed materials, refill of grubbing holes, and performing all operations incidental thereto; all as specified in Section 02110.

b. Unit of measure, job: JB.

(5) "Geotextile (Filter Fabric)"

a. Payment

Payment shall be made at the contract lump sum price and shall constitute full compensation to the Contractor for providing all plant, labor, material, and equipment and performing all operations necessary for the complete and satisfactory installation of the geotextile (filter fabric). The following items are included in the contract lump sum price for "Geotextile (Filter Fabric)" and shall not be counted a second time in the process of determining the extent of geotextile placed: Material and associated equipment and operation used in laps, seams, or extra length; securing pins and associated material, equipment, and operations. No payment will be made for geotextile filter fabric replaced because of waste, contamination, damage, repair, or due to Contractor fault or negligence all as specified in SECTION 02215.

b. Unit of Measure, job: JB.

(6) "Grout for Riprap"

a. Payment

Payment for grout for riprap will be made at the contract lump sum price for "Grout for Riprap", which price and payment shall constitute full compensation for furnishing all labor, equipment, materials, batching; transporting, placing, curing, and performing all other operations incidental thereto, all as specified in SECTION 02542.

b. Unit of measure, job: JB.

(7) "Steel Sheet Piling PSA 23" and "Steel Sheet Piling PZ 27"

a. Payment

Payment for steel sheet piling will be made at the applicable contract lump sum price for "Steel Sheet Piling PSA 23", and "Steel Sheet Piling PZ 27", which price shall include all cost of furnishing, driving, cutting holes, and performing all work specified in Section 02350.

b. Unit of Measure, job: JB.

(8) "Guard Rail"

a. Payment

Payment for guard rail will be made at the contract lump sum price for "Guard Rail," which price and payment shall constitute full compensation for installation of the guard rail, and performing all operations incidental thereto: all as specified in SECTION 05510.

b. Unit of measure, job: JB.

(9) "Aggregate Surfacing"

a. Payment

Payment for aggregate surfacing will be made at the contract lump sum price for "Aggregate Surfacing", which price and payment shall constitute full compensation for furnishing all material and equipment and performing all labor for placing aggregate surfacing; and all other operations incidental thereto; all as specified in SECTION 02546.

b. Unit of measure; job: JB.

(10) "Temporary Earthen Cofferdam Construction"

a. Payment

Payment for temporary earthen cofferdam construction and removal will be made at the contract lump sum price for "Temporary Earthen Cofferdam Construction", which price and payment shall constitute full compensation for

clearing and grubbing; stripping and stockpiling topsoil; excavation, trimming of borrow pit slopes, loading and hauling; preparation of cofferdam foundation surface; installation, maintenance, and removal of temporary pipe culverts used for drainage under cofferdam materials; formation of temporary earthen cofferdam; compaction; performing quality control; testing and sampling; royalties for borrow pit right-of-way and haul routes; removal and restoration of existing fences, removal of temporary cofferdam, final clean up; all equipment and labor; seeding and restoration as required; environmental protection and incidental operations required to complete the work as specified in section 02222 BACKFILLS AND EMBANKMENTS, or as shown on the contract drawings.

b. Unit of measure, job: JB

(11) "6" Compacted Clay Gravel"

a. Payment

Payment will be made for costs associated with "6" Compacted Clay Gravel", as defined in SECTION 02546.

Unit of measure, job: JB.

(12) "Establishment of Turf"

a. Payment

Sodding and/or sprigging completed and accepted will be paid for at the contract lump sum price for "Establishment of Turf".

Payment will be made in accordance with the following schedule:

70% On the first regularly scheduled estimate after the Sodding and Erosion Control process is complete.

30% On acceptance of turfing.

The price shall include full compensation for soil tests; for seedbed preparation' for furnishing and applying lime, fertilizer, soil conditioners, seed, mulch; for watering; for erosion protection; for pesticides; for restoration and clean up; and for all labor, equipment, tools, and incidentals to complete the work all as specified in SECTION 02938.

b. Unit of Measure, job: JB.

(13) "Pumping Station"

a. Payment

Payment item No. 20, "Pumping Station", shall include all work under the contract which is not included in payment items 1 thru 19, unless otherwise specified.

b. Unit of measure, job: JB.

## 1.2 UNIT PRICE PAYMENT ITEMS

### 1.2.1 GENERAL

Payment items for work of this contract on which the contract unit price payments will be made are listed in the BIDDING SCHEDULE and described below. The unit price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for each of the unit price items.

### 1.2.2 UNIT PRICE ITEMS

#### (1) "Riprap "R 140""

##### a. Measurement

If the riprap material is delivered by railroad, weights as acceptable to the railroad for freight charge purposes will be accepted as measurement of the riprap material. Copies of freight bills or certifications of weights acceptable to the railroad for freight charge purposes shall be furnished. If not delivered by railroad, but delivered by truck, the riprap material will be measured for payment, in the presence of a Government Inspector unless waived by the Contracting Officer, by being weighed on approved, accurately calibrated scales furnished by and at the expense of the Contractor. Weight certificates furnished by a public weighmaster where available will be acceptable in lieu of such procedure when authorized by the Contracting Officer. Individual weight tickets shall be furnished the Government Inspector at the time of delivery.

##### b. Payment

Payment for riprap will be made at the contract unit price per ton for "Riprap "R 140"", which price and payment shall include all costs of furnishing, hauling, handling, placement, and maintaining the riprap; all as specified in SECTION 02542.

##### c. Unit of measure, ton: TN.

#### (2) "Excavation"

##### a. Measurement

A survey of the sites for required excavations as specified in this section will be made in accordance with Special Contract Requirement 1.10 prior to the commencement of excavation and except as otherwise specified, all measurement for excavation will be based on this survey. In areas where the cofferdams are to be constructed, the survey shall be made prior to construction of the cofferdams. The quantity of excavation to be paid for will be computed between the ground surface, as determined by the above-noted surveys, and the slopes and grade lines for such excavations as indicated on the drawings and/or specified herein.

##### b. Payment

Payment for excavation will be made at the Contract unit price per cubic yard

for "Excavation", which includes all equipment and labor; all hauling of excavation materials, disposal of excess material, preparation of subgrade for structures and storm drainage, all maintenance of subgrade prior to placement of backfill or construction of structures, all stockpiling of materials in segregated form for use in levee embankment, for final clean up of right-of-way and incidental operations required to complete the work as specified in Section 02221.

c. Unit of Measure, Cubic Yard: CY.

(3) "Pervious Backfill" and "Impervious Backfill and Permanent Embankment"

a. Measurement

Measurement for "Pervious Backfill" and "Impervious Backfill and Permanent Embankment" on each side of the inlet channel will be made within the limits and between the theoretical lines and grades for such work as indicated on the drawings and/or as modified by the Contracting Officer. The yardage to be paid for will be the number of cubic yards placed as specified in this section and measured as specified hereinabove.

b. Payment

Payment for the pervious backfill will be made at the contract unit price per cubic yard for "Pervious Backfill" which price and payment shall constitute full compensation for constructing the pervious backfill as specified in the section. Payment for impervious backfill and permanent embankment on each side of the inlet channel will be made at the contract unit price per cubic yard for "Impervious Backfill and Permanent Embankment" which price and payment shall constitute full compensation for constructing such features of the work as specified in SECTION 02222.

c. Unit of Measure, Cubic Yard: CY.

(4) "Relief Wells"

a. Measurement

Relief wells will be measured for payment by the linear foot of completed well between the ground surface and the elevation three feet below the bottom of the well screen.

b. Payment

Payment for relief wells will be made at the contract unit price, per linear foot, for "Relief Wells", which price shall constitute full compensation for construction of relief wells all as specified in SECTION 02708. Wells ordered abandoned by the Contracting Officer before installation of well screen and riser, due to no fault of the Contractor, will be paid for at 50 percent of the contract unit price per linear foot, for "Relief Wells". Wells ordered abandoned by the Contracting Officer after installation of well screen and casing, due to no fault of the Contractor, will be paid for at the full contract unit price for "Relief Wells". No payment will be made for placement or replacement of temporary drilling casings or repair of damage resulting from Contractor operations. No separate payment will be made for

relief well screen, risers, gravel pack, grout, development, Ottawa sand and concrete backfill, discharge or outlet discharge assembly. No payment will be made for any wells or drilled holes that, in the opinion of the Contracting Officer, are abandoned due to Contractor fault or neglect.

c. Unit of measure, linear foot: LF.

(5) "Water Well"

a. Measurement

Measurement for payment of the drilled water well between the bottom of the screen and the top of the casing will be made on the basis of the length along the centerline of the casing, drilled hole, and screen.

b. Payment

Payment for drilled water well will be made at the applicable contract unit price per linear foot depth for "Water Well 0014AA First 500 Linear Feet Depth" or "Water Well 0014AB All Over 500 Linear Feet Depth" which price and payment shall constitute full compensation for furnishing all labor, equipment and materials, and performing all operations in connection with drilling the well, installing the casing, grouting the casing in place, installing the screen, installing service pipe to building, installing hypochlorination system, installing hydro-pneumatic water pressure tank and piping up to and including the gate valve on the discharge pipe of the water pressure tank.

c. Unit of measure, Linear Feet Depth: LF.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

--End of Section--

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01130

ENVIRONMENTAL PROTECTION

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01130

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 DEFINITIONS

For the purpose of this specification, environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of air, water, and land, and includes management of visual aesthetics, noise, solid waste, radiant energy and radioactive materials, as well as other pollutants.

1.2 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection. 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 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.

1.2.1 Environmental Protection Plan

Within 21 days after receipt of Notice of Award of the contract, the Contractor shall submit in writing an Environmental Protection Plan and, prior to starting work, meet with representatives of the Contracting Officer to develop mutual understanding relative to compliance with this provision and administration of the environmental protection program. Approval of the Contractor's plan will not relieve the Contractor of his responsibility for adequate and continuing control of pollutants and other environmental protection measures. The Government reserves the right to make changes in his environmental protection plan and operations as necessary to maintain satisfactory environmental protection performance. The Environmental Protection Plan shall include but not be limited to the following:

1.2.1.1 Protection of Features

The Contractor shall determine methods for the protection of features to be preserved within authorized work areas. The Contractor shall prepare a listing

of methods to protect resources needing protection, i.e., trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, archaeological and cultural resources.

#### 1.2.1.2 Procedures

The Contractor shall implement procedures to provide the required environmental protection and to comply with the applicable laws and regulations. The Contractor shall set out the procedures to be followed to correct pollution of the environment due to accident, natural causes or failure to follow the procedures set out in accordance with the Environmental Protection Plan.

#### 1.2.1.3 Permit or License

The Contractor shall obtain all needed permits or licenses.

#### 1.2.1.4 Drawings

The Contractor shall include drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, stockpiles of earth materials, and disposal areas for excess earth material and unsatisfactory earth materials.

#### 1.2.1.5 Environmental Monitoring Plans

The Contractor shall include environmental monitoring plans for the job site which incorporate land, water, air and noise monitoring.

#### 1.2.1.6 Traffic Control Plan

The Contractor shall include a traffic control plan for the job site.

#### 1.2.1.7 Surface and Ground Water

The Contractor shall establish methods of protecting surface and ground water during construction activities.

#### 1.2.1.8 Work Area Plan

The Contractor shall include a work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. The plan shall include measures for marking the limits of use areas.

#### 1.2.1.9 Plan of Borrow Area(s)

The Contractor shall include a plan of borrow area(s) for the job site.

### 1.3 SUBCONTRACTORS

Assurance of compliance with this section by subcontractors will be the responsibility of the Contractor.

#### 1.4 PERMITS OBTAINED BY CORPS OF ENGINEERS

The Corps of Engineers will not obtain any permits for this project. See Contract Clause entitled "PERMITS AND RESPONSIBILITIES".

#### 1.5 REGULATORY REQUIREMENTS

The Contractor shall comply with all state regulatory and statutory requirements.

### PART 2 PRODUCTS (Not Applicable)

### PART 3 EXECUTION

#### 3.1 PROTECTION OF ENVIRONMENTAL RESOURCES

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his activities to areas defined by the contract drawings or specifications. Environmental protection shall be as stated in the following subparagraphs.

##### 3.1.1 Protection of Land Resources

Prior to the beginning of any construction, the Contracting Officer will identify all land resources to be preserved within the Contractor's work area. The Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without special permission from the Contracting Officer. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such special emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs.

##### 3.1.1.1 Work Area Limits

Prior to any construction, the Contractor shall mark the areas where no work is to be performed under this contract. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence and during all construction operations. Where construction operations are to be conducted during darkness, the markers shall be visible during darkness. The Contractor shall convey to his personnel the purpose of marking and/or protection of all necessary objects.

##### 3.1.1.2 Protection of Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features to be preserved, indicated and defined on the drawings submitted by the Contractor as

a part of the Environmental Protection Plan, shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.

#### 3.1.1.3 Reduction of Exposure of Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated and specified. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in instances where the constructed feature obscures borrow areas, quarries and waste material areas, these areas shall not initially be cleared in total. Clearing of such areas shall progress in reasonably sized increments as needed to use the areas developed as approved by the Contracting Officer.

#### 3.1.1.4 Temporary Protection of Disturbed Areas

Such methods as necessary shall be utilized to effectively prevent erosion and control sedimentation, including but not limited to the following:

##### a. Retardation and Control of Runoff

Runoff from the construction site shall be controlled by construction of diversion ditches, benches, and berms to retard and divert runoff to protected drainage courses, and the Contractor shall also utilize any measures required by area-wide plans approved under Paragraph 208 of the Clean Water Act.

#### 3.1.1.5 Erosion and Sedimentation Control Devices

The Contractor shall construct or install all temporary and permanent erosion sedimentation control features. Temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basin, grassing and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operative.

#### 3.1.1.6 Location of Contractor Facilities

The Contractor's field offices, staging areas, stockpiles, storage, and temporary buildings shall be placed in areas designated on the contract drawings and approved by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only on approval by the Contracting Officer.

#### 3.1.1.7 Borrow Areas on Government Property

Borrow areas on Government property shall be managed to minimize erosion and to prevent sediment from entering nearby water courses or lakes.

#### 3.1.1.8 Disposal Areas on Government Property

Disposal areas on Government property shall be managed and controlled to limit material to areas designated on the contract drawings and prevent erosion of soil

or sediment from entering nearby water courses or lakes. Disposal areas shall be developed in accordance with the grading plan indicated on the contract drawings.

#### 3.1.1.9 Temporary Excavation and Embankments

Temporary excavation and embankments shall be controlled to protect adjacent areas from contamination.

#### 3.1.1.10 Disposal of Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. All handling and disposal shall be conducted to prevent contamination. The Contractor shall transport all solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal.

#### 3.1.1.11 Disposal of Chemical Wastes

Chemical wastes shall be stored in corrosion resistant containers, removed from the work area and disposed of in accordance with Federal, State, and local regulations.

#### 3.1.1.12 Disposal of Discarded Materials

Discarded materials other than those which can be included in the solid waste category shall be handled as directed by the Contracting Officer.

### 3.2 HISTORICAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

Existing historical, archaeological and cultural resources within the Contractor's work area will be so designated by the Contracting Officer and precautions shall be taken by the Contractor to preserve all such resources as they existed at the time they were pointed out to the Contractor. The Contractor shall install all protection for these resources so designated on the contract drawings and shall be responsible for their preservation during this contract. If during construction items of apparent archaeological or historical interest are discovered, they shall be left undisturbed and the Contractor shall report the find immediately to the Contracting Officer.

### 3.3 PROTECTION OF WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to avoid pollution of surface and ground waters. Special management techniques as set out below shall be implemented to control water pollution by the listed construction activities which are included in this contract.

#### 3.3.1 Cofferdam and Diversion Operations

The Contractor shall plan his operations and perform all work necessary to minimize adverse impact or violation of the water quality standard. Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure shall be controlled at all times to limit impact of water turbidity on the habitat for wildlife and impacts on water quality for downstream use.

### 3.3.2 Stream Crossings

Stream crossings shall be controlled during construction. Crossings shall provide movement of materials or equipment which do not violate water pollution control standards of the Federal, State or local government.

### 3.3.3 Monitoring of Water Areas Affected by Construction Activities

Monitoring of water areas affected by construction activities shall be the responsibility of the Contractor. All water areas affected by construction activities shall be monitored by the Contractor.

## 3.4 PROTECTION OF FISH AND WILDLIFE RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to minimize interference with, disturbance to and damage of fish and wildlife. Species that require specific attention along with measures for their protection shall be listed by the Contractor prior to beginning of construction operations.

## 3.5 PROTECTION OF AIR RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with the laws of the State of Missouri and all Federal emission and performance laws and standards. Special management techniques as set out below shall be implemented to control air pollution by the construction activities which are included in the contract.

### 3.5.1 Particulates

Dust particles, aerosols, gaseous by-products from all construction activities, processing and preparation of materials, such as from asphaltic batch plants, shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards mentioned in the paragraph "PROTECTION OF AIR RESOURCES" to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the

work area. Sprinkling, to be efficient, must be repeated at such intervals as to keep the disturbed area damp at all times. The Contractor must have sufficient competent equipment available to accomplish this task. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

#### 3.5.2 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

#### 3.5.3 Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

#### 3.5.4 Monitoring Air Quality

Monitoring of air quality shall be the responsibility of the Contractor. All air areas affected by the construction activities shall be monitored by the Contractor.

### 3.6 INSPECTION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with the Contractor's environmental protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and take such action as may be approved. If the Contractor fails 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 time extensions will be granted or costs or damages allowed to the Contractor for any such suspension.

### 3.7 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all area(s) used for construction.

### 3.8 RESTORATION OF LANDSCAPE DAMAGE

The Contractor shall restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Such restoration shall be in accordance with the plans submitted for approval by the Contracting Officer.

### 3.9 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain all constructed facilities and temporary pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

### 3.10 TRAINING OF CONTRACTOR PERSONNEL IN POLLUTION CONTROL

The Contractor shall train his personnel in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities (vegetative covers and instruments required for monitoring purposes) to insure adequate and continuous environmental pollution control.

-- End of Section --

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01330

SUBMITTAL PROCEDURES

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL IDENTIFICATION

SD-01 Data

SD-04 Drawings

SD-06 Instructions

SD-07 Schedules

SD-08 Statements

SD-09 Reports

SD-13 Certificates

SD-14 Samples

SD-18 Records

SD-19 Operation and Maintenance Manuals

1.2 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.2.1 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."

1.2.2 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.

1.3 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 an error that may exist, as the Contractor 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, resubmitting for the purpose of substituting materials or equipment will not be considered unless accompanied by an explanation of why a substitution is necessary.

#### 1.4 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.

#### 1.5 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 make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified 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 as those used in the contract drawings. 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 manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

#### 3.2 SUBMITTAL REGISTER (ENG FORM 4288-R)

At the end of this section is one set of ENG Form 4288-R listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. A copy of ENG Form 4288-R is also included at the end of this section. The Contractor will also be given the submittal register as a

diskette containing the computerized ENG Form 4288-R and instructions on the use of the diskette. Columns "d" through "q" have been completed by the Government; the Contractor shall complete columns "a" and "r" through "t" and submit the forms (hard copy plus associated electronic file) to the Contracting Officer for approval within 15 calendar days after Notice to Proceed. The Contractor shall keep this diskette up-to-date and shall submit it to the Government together with the monthly payment request. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated.

### 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 15 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals. Government approval times should be 30 days for correct submittals or 60 days for deviating submittals

### 3.4 TRANSMITTAL FORM (ENG FORM 4025-R)

The sample transmittal form (ENG Form 4025-R) 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 shall 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

Submittals shall be prepared as specified with the required number of copies and delivered to:

Caruthersville Area Office  
706 Harry S. Truman blvd.  
Caruthersville, Missouri 63830-1268

#### 3.5.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025-R 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 approval by being so stamped and dated. Four copies of the submittal will be retained by the Contracting Officer and two (2) 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; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and 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 that shown on the following page:

CONTRACTOR (Firm Name)	
_____	Approved
_____	Approved with corrections as noted on submittal data and/or attached sheets(s)
SIGNATURE:	_____
TITLE:	_____
DATE:	_____

End of Section

























































SUBMITTAL REGISTER (ER 415-1-10)															CONTRACT NO.											
TITLE AND LOCATION DRINKWATER PUMPING STATION NO. 2 MISSISSIPPI COUNTY, MISSOURI										CONTRACTOR					SPECIFICATION SECTION 09250											
ACTIVITY NO.	TRANSMITTAL NO.	ITEM NO.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		CONTRACTOR SCHEDULE DATES		CONTRACTOR ACTION		GOVERNMENT ACTION		REMARKS			
					DRAWINGS	INSTRUMENTS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	INFORMATION	GOVERNMENT REVIEW	DATE	APPROVAL NEEDED BY	MATERIAL NEEDED BY	DATE	SUBMIT TO GOVERNMENT	DATE	CODE					
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	
			1.3	Drawings	X									X		C										
			1.3	Certificates	X									X		C										











SUBMITTAL REGISTER (ER 415-1-10)																	CONTRACT NO.								
TITLE AND LOCATION										CONTRACTOR							SPECIFICATION SECTION								
DRINKWATER PUMPING STATION NO. 2 MISSISSIPPI COUNTY, MISSOURI																	15160								
ACTIVITY NO.	TRANSMITTAL NO.	ITEM NO.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		CONTRACTOR SCHEDULE DATES		CONTRACTOR ACTION		GOVERNMENT ACTION		REMARKS		
					DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	CERTIFICATES	SAMPLES	RECORDS	INFORMATION	GOVERNMENT REVIEW	APPROVAL NEEDED BY	MATERIAL NEEDED BY	DATE	SUBMIT TO GOVERNMENT	DATE	REMARKS						
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
			1.2	Records and Tests										X	X										
			1.5	Data: Materials List					X						X										
			1.5	Data: Materials Manufacturers					X						X										
			1.5	Spare Parts	X										X										
			1.5	Torsion Analysis						X					X										
			1.5	Drawings		X									X										
			1.5	Instructions			X								X										
			1.5	Statements				X							X										
			1.5	Samples								X			X										
			1.5	Manuals			X								X										
			1.6	Welders (Certification)							X				X										
			1.7	Erecting Engineer Records									X		X										
			2.5.1.2	Report: Dynamic Analysis						X					X										
			2.5.3.8	Test Report (Witness Test)						X					X										













SUBMITTAL REGISTER (ER 415-1-10)														CONTRACT NO.											
TITLE AND LOCATION				DRINKWATER PUMPING STATION NO. 2 MISSISSIPPI COUNTY, MISSOURI										CONTRACTOR			SPECIFICATION SECTION 16264								
ACTIVITY NO.	TRANSMITTAL NO.	ITEM NO.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION		CONTRACTOR SCHEDULE DATES		CONTRACTOR ACTION		GOVERNMENT ACTION		REMARKS		
					DRAWINGS	INSTRUCTIONS	STATEMENTS	CERTIFICATES	REPORTS	PERMITS	RECORDS	INFORMATION	GOVERNMENT REVIEW	APPROVAL NEEDED BY	MATERIAL NEEDED BY	DATE	SUBMIT TO GOVERNMENT	DATE	REMARKS						
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
			1.2	Records and Tests										X	X										
			1.6	Data	X									X											
			1.6	Shop Drawings		X									X										
			1.6	Instructions			X							X											
			1.6	Statements				X						X											
			1.6	Reports					X					X											
			1.6	Certificates						X				X											





<b>TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE</b> <i>(Read instructions on the reverse side prior to initiating this form)</i>	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: <input type="checkbox"/> THIS IS A NEW TRANSMITTAL <input type="checkbox"/> THIS IS A RESUBMITTAL OF TRANSMITTAL _____
SPECIFICATION SEC. NO. <i>(Cover only one section with each transmittal)</i>	PROJECT TITLE AND LOCATION		CHECK ONE: THIS TRANSMITTAL IS FOR <input type="checkbox"/> FIO <input type="checkbox"/> GOV'T. APPROVAL

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

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 other wise stated.  <hr style="width: 80%; margin-left: auto; margin-right: 0;"/> NAME AND SIGNATURE OF CONTRACTOR
---------	--

<b>SECTION II - APPROVAL ACTION</b>		
ENCLOSURES RETURNED <i>(List by Item No.)</i>	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.	E	--	Disapproved (See attached).
B	--	Approved, except as noted on drawings.	F	--	Receipt acknowledged.
C	--	Approved, except as noted on drawings. Refer to attached sheet resubmission required.	FX	--	Receipt acknowledged, does not comply as noted with contract requirements.
D	--	Will be returned by separate correspondence.	G	--	Other ( <i>Specify</i> )

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

*(Reverse of ENG Form 4025-R)*

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01451

CONTRACTOR QUALITY CONTROL

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01451

CONTRACTOR QUALITY CONTROL

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 (1990) Use in the Evaluation of Testing and Inspection Agencies as 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 unit prices or 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 off-site, and shall be keyed to the proposed construction sequence.

3.2 QUALITY CONTROL PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 21 days after receipt of Notice of Award of the contract, 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 15 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 off-site, including work by subcontractors, fabricators, 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 manager or someone higher in the Contractor's organization. Project manager in this context shall mean the individual with responsibility for the overall management of the project including quality and production.

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, off-site fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 1330 - 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.)

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

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.

### 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 QC plan, the Contractor shall notify the Contracting Officer in writing a minimum of seven calendar days prior to 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 Quality Control Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. 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 off-site 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 CQC System Manager

The Contractor shall identify an individual within his organization at the worksite who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. This CQC System Manager shall be subject to acceptance by the Contracting Officer. The CQC System

Manager shall be assigned as System Manager but may have other duties in addition to quality control.

#### 3.4.2 CQC Staff

A staff shall be maintained under the direction of the CQC System Manager to perform all CQC activities. An alternate will be identified to serve in the absence of the CQC System Manager. The staff must be of sufficient size to ensure adequate CQC coverage of all work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned CQC responsibilities and must be allowed sufficient time to carry out these responsibilities. The CQC plan will clearly state the duties and responsibilities of each staff member. All CQC Staff members or replacements shall be subject to acceptance by the Contracting Officer.

#### 3.4.3 Additional Requirement

In addition to the above requirements, the CQC System Manager and his alternate, and including individuals appointed as alternates, shall have completed the course entitled "Construction Quality Management for Contractors", prior to performing his QC duties. This course is periodically offered by the Memphis District as well as other Corps Districts.

#### 3.5 SUBMITTALS

Submittals shall be in accordance with Section 1330 - SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

#### 3.6 CONTROL

The controls shall include at least three phases of control to be conducted by the CQC System Manager for all definable features 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. A check to assure that provisions 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.

h. Discussion of procedures for constructing the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that phase 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. The Government shall be notified at least 24 hours in advance of beginning any of the required action of the preparatory 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 preliminary work to ensure that it is in compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verification of 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 sample panels is 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 24 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 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 continuing compliance with contract requirements, including control testing, 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

As determined by the Government, additional preparatory and initial phases may 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.

## 3.7 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. 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 off-site 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 Contracting Officer 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 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. There will be no extension of time allowed due to necessity to perform capability rechecks.

### 3.7.3 On-Site Laboratory

The Contracting Officer 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 by the Contractor to a location specified by the Contracting Officer.

## 3.8 COMPLETION INSPECTION

At the completion of all work or any increment thereof established by a completion time stated in the Special Contract Requirements 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. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Government. These inspections and any deficiency corrections required by this paragraph will be accomplished within the time stated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate

completion dates.

### 3.9 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 24 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 in ink 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.

### 3.10 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.

-- End of Section --

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01452

PROJECT SIGNS, BARRICADES, AND TRAFFIC CONTROL SIGNS

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01452

PROJECT SIGNS, BARRICADES, AND TRAFFIC CONTROL SIGNS

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing, erecting, maintaining, and removing project signs, barricades, and traffic control signs.

1.2 PROJECT SIGNS

The Contractor shall furnish, erect, and maintain one double-faced project sign, at the specific location designated by the Contracting Officer. The sign shall be constructed of 3/4-inch A-C exterior plywood or 22 gage metal, mounted on a substantial framework of 2-inch material. Size, lettering, color and paint shall conform to the details shown on the drawing "Temporary Project Sign" included at the end of this section. Upon request, the Government will furnish without cost to the Contractor two decals of the Engineer Castle. The sign shall be erected as soon as practicable, but not later than 15 calendar days after the date established for commencement of work. The sign shall be removed upon completion of all other construction work under the contract and will become the property of the Contractor.

1.3 BARRICADES AND TRAFFIC CONTROL SIGNS

Barricades and traffic control signs shall be those as recommended by the Contracting Officer and conform to the "Manual on Uniform Traffic Control Devices for Streets and Highways," Current Edition.

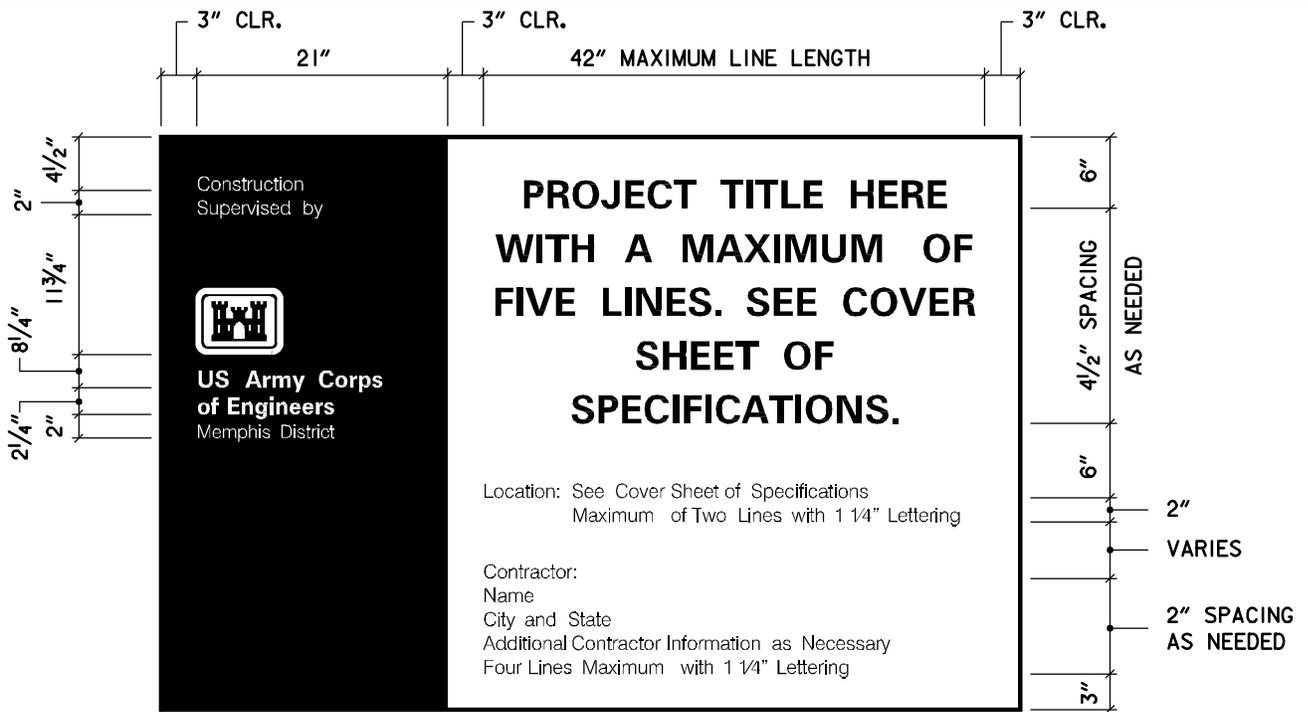
1.4 PAYMENT

No separate payment will be made for erecting, maintaining and removing project signs, barricades, and traffic control signs and all costs in connection therewith will be considered an incidental obligation of the Contractor.

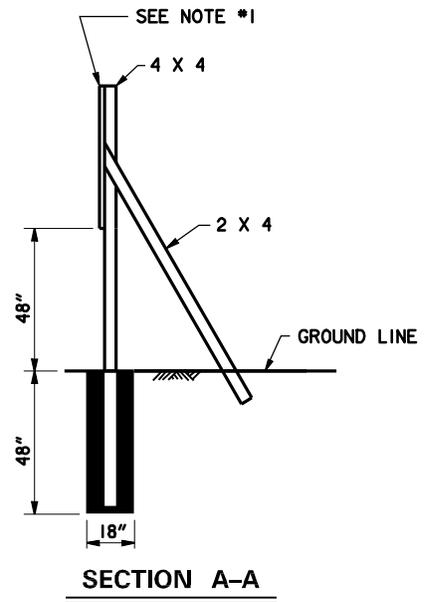
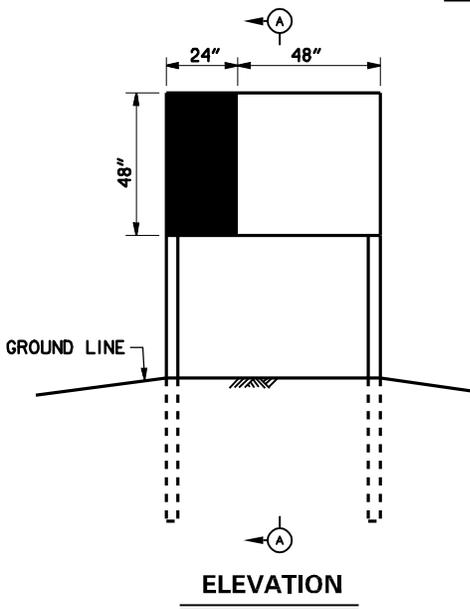
PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

--End of Section--



## ELEVATION



## SPECIFICATIONS

1. SIGN PANEL SHALL BE 4' x 6' x 3/4" EXTERIOR GRADE PLYWOOD OR 22 GAGE SHEET METAL.
2. POSTS AND BRACING SHALL BE TREATED, NO.1 GRADE YELLOW PINE.
3. ALL EXPOSED SURFACES SHALL BE GIVEN ONE COAT OF LINSEED OIL AND WIPED PRIOR TO PRIMING.
4. ALL EXPOSED SURFACES SHALL BE GIVEN ONE COAT OF WHITE AS PRIMER. SECOND COAT SHALL BE COMMUNICATIONS RED ON LEFT AND WHITE ELSEWHERE.
5. THE LEFT SECTION SHALL BE RED WITH WHITE LEGEND. THE RIGHT SECTION SHALL BE WHITE WITH BLACK LEGEND.
6. PAINT SHALL BE BENJAMIN MOORE NO. 120-60 POLY-SILICONE ENAMEL OR APPROVED EQUAL.
7. ALL LETTERING SHALL BE 1/4" WITH A TWO INCH LETTER SPACING UNLESS NOTED OTHERWISE. THE WORDS "US Army Corps of Engineers" SHALL BE 1/2" TALL. THE PROJECT TITLE LETTERING SHALL BE A MINIMUM OF 1/2" TALL AND A MAXIMUM OF 3/2" TALL. THE LETTERING SIZE SHALL BE CHOSEN SUCH THAT LARGEST POSSIBLE LETTERS ARE USED WITHOUT EXCEEDING A MAXIMUM LINE LENGTH OF 42". THE NUMBER OF LINES IN THE PROJECT TITLE SHALL MATCH THAT SHOWN ON THE COVER SHEET OF THE SPECIFICATIONS.

SCALE: NONE

JANUARY 1999

U.S. ARMY ENGINEER DISTRICT, MEMPHIS  
CORPS OF ENGINEERS  
MEMPHIS, TENNESSEE

**TEMPORARY  
PROJECT SIGN**

DIVISION 2 - SITE WORK

SECTION 02110

CLEARING AND GRUBBING

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DIVISION 2 - SITE WORK

SECTION 02110

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, equipment, and materials, and performing all operations necessary for the clearing and grubbing of the areas specified herein, for the disposal of debris from clearing and grubbing, and for the filling of grubbing holes; all as specified herein and/or indicated on the drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Clearing

Location, heights, limits, removal of lodgments in channel.

(2) Disposal of Cleared Materials

Method and location of burning, damage to timber and/or areas within rights-of-way which are not to be cleared.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

### 3.1 CLEARING

Clearing shall consist of the complete removal above the ground surface and/or excavated surface, as applicable, of all trees, stumps, down timber, fencing, snags, brush, vegetation, and other debris. Areas to be cleared shall include all specific areas where any work is required, and all other areas within the right-of-way limits which are necessary for construction operations and operation of the Contractor's equipment. Unnecessary removal of trees or damage to trees to be left standing will not be allowed. If regrowth of vegetation or trees occurs after clearing and before applicable construction, the Contractor will be required to clear the area again prior to construction operations and no payment will be made therefor. Clearing may be performed in conjunction with grubbing operations.

### 3.2 GRUBBING

Grubbing shall consist of the removal of all stumps, tap roots, buried logs, and other projections, which have a cross section more than 1 ½ inches in diameter. Foundations of structures and related backfill, and foundations of permanent embankments, exclusive of embankment placed in the excavated material disposal area, shall be grubbed to a depth of at least 2 feet below the applicable existing or excavated surfaces. The areas to be grubbed are those specific areas within the limits specified hereinabove from which trees, stumps, down timber, fencing, snags, and other projections have been removed as specified in 3.1 above. All objectionable matter shall be removed from excavated materials which will subsequently be used in backfills and embankments including the cofferdams. All holes caused by grubbing, except in excavations, shall be filled with suitable material as approved by the Contracting Officer in 12-inch layers to the elevation of the adjacent ground surface or excavated surface, as applicable, and each layer compacted to a density at least equal to that of the adjoining undisturbed material.

### 3.3 DISPOSAL OF DEBRIS

#### 3.3.1 General

All debris resulting from clearing and grubbing operations on this contract shall, at the Contractor's option, be disposed of by burning or removal from the site. The Contractor shall make a reasonable effort to utilize this last method to channel materials of value resulting from clearing and grubbing operations into beneficial use.

#### 3.3.2 Burning

The Contractor shall comply with the applicable pollution restrictions of the Missouri Air Conservation Commission, P.O. Box 1062, Jefferson City, Missouri. Subject to such restrictions and obtaining any permit which may be required by said department, the Contractor may burn material within the contract area, and at any time within the contract period, provided such burning does not cause the above standards to be exceeded. Burning operations shall be

conducted so as to prevent damage to standing timber or other flammable growth. The Contractor will be responsible for any damage to life and/or property resulting from fires that are started by his employees or as a result of his operations. The Contractor shall furnish at the site of burning operations adequate fire fighting equipment to properly equip his personnel for fighting fires. Fires shall be guarded at all times and shall be under constant surveillance until they have been extinguished.

### 3.3.3 Removal from Site

The Contractor may elect to remove all debris resulting from clearing and grubbing operations, stoves, hot water heaters, old tires and other such debris from the site of the work. Such disposal shall comply with all applicable Federal, State and local laws. The Contractor may, at his option retain for his own use or disposal by sale or otherwise any such materials of value. The Government assumes no responsibility for the protection or safekeeping of any materials retained by the Contractor. Such materials shall be removed from the site of the work before the date of completion of the work. The locations and manner of placement of clearing and grubbing debris on the right-of-way by the Contractor for his convenience prior to removal of the debris from the site of the work shall be subject to the approval of the Contracting Officer. If debris from clearing operations is placed on adjacent property, the Contractor shall obtain without cost to the Government, additional right-of-way for such purposes. Such material shall be so placed as not to interfere with roads, drainage or other improvements and in such a manner as to eliminate the possibility of its entering into channels, ditches, or streams. The Contractor shall furnish written evidence to the Contracting Officer that he has obtained from the property owner, permission for disposal of material on the owner's property. The written evidence shall consist of an authenticated copy of the conveyance under which the Contractor acquired the property rights and access thereto, prepared and executed in accordance with the laws of the State of Missouri. If temporary rights are obtained by the Contractor, then the period of time shall coincide with SC-1 hereof, plus a reasonable time for any extension granted for completion of the work.

--End of Section--

DIVISION 2 - SITE WORK

SECTION 02215

GEOTEXTILE (FILTER FABRIC)

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DIVISION 2 - SITE WORK

SECTION 02215

GEOTEXTILE (FILTER FABRIC)

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all plant, labor, material, and equipment and performing all operations required for furnishing, hauling, and placing the geotextile complete, as specified herein, and maintaining the geotextile until applicable cover is completed and accepted.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Material

Conforms to specifications.

(2) Placement

Location, foundation, limits, anchoring, laps, finished surfaces.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATION

The following publication of the issues listed below, but referred to thereafter by basic designation only, forms a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

D 1683-90a Failure in Sewn Seams of Woven Fabrics

D 4439-95 Terminology for Geotextiles

D 4491-96	Water Permeability of Geotextiles by Permittivity
D 4533-91 (R 1996)	Trapezoid Tearing Strength of Geotextiles
D 4632-91 (R 1996)	Grab Breaking Load and Elongation of Geotextiles
D 4751-95	Apparent Opening Size of a Geotextile
D 4833-88 (R 1996)	Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
D 4886-88 (R 1995) and Ed.Cmt.1	Abrasion Resistance of Geotextiles (SandPaper/Sliding Block Method)

## PART 2 PRODUCTS

### 2.1 GEOTEXTILE

#### 2.1.1 General

The geotextile shall be a non-woven pervious sheet of plastic yarn as defined by ASTM D 4439. The geotextile shall meet the physical requirements listed in Table No. 1, inserted at the end of this section. The geotextile shall provide an Equivalent Opening Size (EOS) no finer than the U.S. Standard Sieve No. 100 and no coarser than the U.S. Standard Sieve No. 50. The geotextile shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, ethylene, amide or vinylidene-chloride, and shall contain stabilizers and/or inhibitors added to the base plastic if necessary to make the filaments resistant to deterioration due to ultra-violet and heat exposure. The edges of the geotextile shall be finished to prevent the outer yarn from pulling away from the geotextile.

#### 2.1.2 Seams

The seams of the geotextile shall be sewn with thread of a material meeting the chemical requirements given above for geotextile yarn or shall be bonded by cementing or by heat. The sheets of geotextile shall be attached at the factory or another approved location, if necessary, to form sections using the manufacturer's standard width or a width of 12-feet, whichever is greater. Seams shall be tested in accordance with method ASTM D 1683, using 1-inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall be not less than 90 percent of the required tensile strength (Table No. 1) of the unaged

geotextile in any principal direction. "Table No. 1 - Physical Requirements" is at the end of this section.

### 2.1.3 Acceptance Requirements

All brands of geotextile and all seams to be used will be accepted on the following basis. The Contractor shall furnish the Contracting Officer, in duplicate, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile. The mill certificate or affidavit shall attest that the geotextile meets the chemical, physical and manufacturing requirements stated in this specification. If requested by the Contracting Officer, the Contractor shall provide to the Government geotextile samples for testing to determine compliance with any or all of the requirements in this specification. When samples are to be provided, they shall be submitted a minimum of 60 days prior to the beginning of installation of the same geotextile. All samples provided shall be from the same production lot as will be supplied for the contract, and shall be the full manufactured width of the geotextile by at least 10 ft. long, except that samples for seam strength may be a full width sample folded over and the edges stitched for a length of at least 5 feet. Samples submitted for testing shall be identified by manufacturer's lot designation.

### 2.2 SECURING PINS

Securing pins shall be 3/16-inch in diameter, steel, pointed at one end and fabricated with a head to retain a steel washer having an outside diameter of no less than 1.5 inches. The length of the pins shall be no less than 18 inches. Securing pins with washers shall be inserted through both strips of overlapped cloth at not greater than 2 foot intervals along a line through the midpoint of the overlap. Additional pins shall be installed as necessary to prevent any slippage of the filter cloth regardless of location.

### 2.3 SHIPMENT AND STORAGE

During all periods of shipment and storage, the geotextile shall be protected from direct sunlight, ultra-violet rays, temperatures greater than 140 degrees F, mud, dirt, dust and debris. To the extent possible, the geotextile shall be maintained wrapped in a heavy duty protective covering.

## PART 3 EXECUTION

### 3.1 BASE PREPARATION

Areas on which geotextile is to be placed shall be dressed to remove humps and depressions within the slope lines and to provide relatively smooth and uniform

surfaces to conform to the cross sections shown on the drawings and as described henceforth in this paragraph. Immediately prior to placing the geotextile, the prepared base will be inspected by the Contracting Officer and no geotextile shall be placed until those areas have been approved.

### 3.2 INSTALLATION

The geotextile shall be placed in the locations shown on the drawings. At the time of installation, geotextile will be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage. The geotextile shall be laid smooth and free of tension, folds, wrinkles or creases. The strips shall be placed to provide a minimum width of 12 inches of overlap for each joint. The geotextile shall be secured as specified in 2.2 above and any additional securing regardless of location shall be made as necessary to prevent any slippage of the geotextile. The geotextile shall be protected at all times during construction from contamination by surface runoff and any geotextile so contaminated shall be removed and replaced with uncontaminated geotextile. The geotextile shall be installed from the downstream end to the upstream end, and from above water line of the slope to top bank. Any geotextile damaged during its installation or during placement of the specified material upon or against the geotextile shall be replaced by the Contractor at no cost to the Government. The work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within 7 days after placement of the geotextile. Failure to comply will require replacement of geotextile. The geotextile shall be protected from damage due to the placement of material thereon by limiting the height of drop of the material. At no time will the riprap be dropped or placed from a height greater than 1 foot from the surface of the geotextile. Before placement of material thereon, the Contractor shall demonstrate that the placement technique will prevent damage to the geotextile. Also, after installation of geotextile, no construction equipment of any type will be allowed on the geotextile surface before or after stone placement.

-- End of Section --

Table No. 1 - Physical Requirements

<u>Physical Property</u>	<u>Test Procedure</u>	<u>Applicable Values++</u>
Geotextile Permeability (Kg)	ASTM D 4491 Test Methods For Water Permeability of Geotextiles by Permittivity	The permeability of the Geotextile shall be greater than 0.49 Feet Per Minute (0.25 Centimeters per Second)
Tear Strength	ASTM D 4533 Trapezoidal Tear Strength	30 pounds minimum in any principal direction
Tensile Strength +(unaged geotextile)	ASTM D 4632 Determine breaking load as specified in the ASTM	200 pound minimum in any principal direction
Breaking Elongation +(unaged geotextile)	ASTM D 4632 Determine Apparent Elongation Breaking	15 percent minimum in any principal direction
Equivalent Opening Size (EOS)	ASTM D 4751 Determine Apparent Opening Size-AOS (EOS)	No finer than the U.S. Standard Sieve No. 100 and no coarser than the U.S. Standard Sieve No. 50
Puncture Strength +(unaged geotextile)	ASTM D 4833 Determine puncture resistance as specified in the ASTM	80 pound minimum
Abrasion Resistance	ASTM D 4886 Determine breaking load after abrasion test as specified in ASTM	55 pound minimum Residual Breaking Load in any principal direction
(N/A)	(N/A)	(N/A)
Percent Open Area (POA)	Specification Paragraph titled, "Determination of Percent Open Area."	The percent of open area shall not be less than ( ) percent

+Unaged geotextile is defined as geotextile in the condition received from the manufacturer or distributor.

++All numerical values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the minimum in the table).

DIVISION 2 - SITE WORK

SECTION 02220

DEWATERING

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DIVISION 2 - SITE WORK

SECTION 02220

DEWATERING

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all plant, labor, material and equipment and performing all operations required for designing, furnishing, installing and operating a system or systems to dewater the excavation area; maintaining the area free from water during construction operations; rewatering the area under controlled conditions at the termination of the dewatering; and removing the system.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for all dewatering operations to assure compliance with contracting requirements and maintain records of his quality control for all construction operations, including but not limited to the following:

- (1) Fabrication and workmanship.
- (2) Installation, operation and removal.
- (3) Monitoring free water surface and piezometric elevations.
- (4) Measuring effluent from dewatering system.
- (5) Monitoring of sanding.

A copy of these records and tests, as well as the corrective action taken,

shall be furnished the Government. Reports of operation and inspection shall include the following data: piezometer elevations, river stages, time of operation of each well, effluent discharge, sanding rates during pump test, problems encountered, proposed actions, and any other pertinent data.

### 1.3 GENERAL

All permanent work under this contract except as otherwise specified shall be carried on in areas free of water. The Contractor shall design, furnish, install, operate and maintain such facilities necessary to accomplish the following:

(1) Collect and dispose of all surface water in the protected area regardless of source.

(2) Control and dispose of all surface water around the periphery of the excavation areas to prevent such water from entering the excavation.

(3) Lower and maintain the water table at least 5 feet below the bottom of the excavated, and at least 2 feet below the side slopes.

(4) Install and monitor construction piezometers.

### 1.4 DEFINITIONS

#### 1.4.1 Dewatering

Dewatering defines the lowering of the ground water below the slopes and bottom of the excavation to ensure dry, firm working conditions and the reduction to safe levels of any hydrostatic uplift pressures in any confined foundation strata and/or aquifers which is necessary to ensure the stability and integrity of the foundation.

#### 1.4.2 Dewatering System

Dewatering System defines the machinery, equipment and appurtenances necessary for and related to the accomplishment of dewatering, and the collection and disposal of all surface water within the protected area.

#### 1.4.3 Flooding

Flooding of the excavation is defined as the controlled process of filling the excavation with water to a specified elevation and at a specified rate.

#### 1.4.4 Unwatering

Unwatering is defined as the process of removing all water within an excavation.

#### 1.4.5 Rewatering

Rewatering is defined as the controlled process of allowing the ground water to return to its natural occurring elevation at a specified rate when the construction is completed and the dewatering system is no longer required.

### 1.5 DESIGN

The dewatering system shall be designed using accepted professional methods of engineering design consistent with the best current practice. The Contractor shall perform necessary tests and/or analyses of the water and soil environment at the site to satisfy himself that the materials used in his system will not corrode or otherwise deteriorate to such an extent that the system will not perform satisfactorily during the life of the contract.

### 1.6 DEWATERING REQUIREMENTS

The dewatering system for the excavation area as shown on Drawing No. C-1 shall be of a type and capacity to accomplish all requirements specified herein.

(1) The dewatering system shall be designed, installed and operated to dewater the excavation for Mississippi River stages up to and including elevation 335 ft. Mississippi River Stage.

(2) The system shall be of such capacity that it will lower and maintain the free water and piezometric levels, to an elevation at least 5 feet below all earth slopes and excavation surfaces lying within the area, inclusive of the interior slopes of the cofferdam embankments proper. The system shall have sufficient capacity to accomplish this desired result allowing for normal variations in soil properties and foundation conditions.

(3) The water level shall be maintained continuously at or below the elevations specified above so that construction operations can be performed without interruption due to wet conditions.

(4) No upward or vertical or lateral flow of ground water into the work

area will be permitted at any time. The dewatering system shall be designed, constructed and operated at all times, including unwatering, rewatering, and/or flooding, so as to prevent movement and/or piping of the foundation, excavation slopes and fill materials. The system shall be operated as necessary during dewatering, unwatering, flooding and rewatering so as to maintain piezometric levels, within the dewatered area, at or beneath the elevation of the water level in the excavation.

(5) The system shall consists of wells pumps, sumps, sump pumps, ditches and necessary appurtenances capable, at all river stages less than or equal to a Mississippi River stage of elevation 335 ft (NGVD) of intercepting seepage before it exits on any interior surface or excavation face and of providing control of surface water. The required dewatering shall be accomplished by using a system of deep wells located on the berm between the excavation and the landside cofferdam to lower the piezometric level in the sand stratum as required in (3) above to prevent flooding filter materials and fresh concrete. Protection of all slopes will be required to prevent erosion under normal surface runoff and construction conditions.

(6) Initial unwatering of an excavation need not be accomplished by sumping alone, but may utilize sumping in addition to positive dewatering accomplished with a system meeting the requirements of (5) above. Initial unwatering shall at all times fulfill the requirements of (4) above.

(7) Rewatering and/or flooding of the area shall be accomplished by directing surface and ground water into the area. The dewatering system shall be kept operating at full capacity during such conditions, with dewatering effluent being directed into the excavation. Protection of slopes and excavation surfaces shall be provided as necessary to prevent erosion during flooding operations. No upward or vertical or lateral flow of ground water into the excavation will be permitted.

(8) Burying of headers will be allowed only in areas and to depths absolutely necessary for protection against damage at construction equipment crossing. The effluent from the dewatering system will be required to be discharged over the top of the mainline levee (El. 340) and extend to the riverside toe before release from the discharge pipe (s). The water shall be controlled to prevent erosion or damage to the existing natural ground.

(9) A system of construction piezometers will be required to monitor free water surface elevations and piezometric elevations to evaluate the effectiveness of the dewatering system in fulfilling the requirements specified herein. Piezometers shall be of adequate numbers and in suitable arrangements and depths for determining the free water surface elevations and piezometric elevation over the area. A minimum of three piezometers shall be installed with the dewatering system. Approximate locations are shown on the excavation plan on Drawing No. C-1. The three piezometers shall be installed in the underlying sand strata with the tip of the screen placed at elevation 282 ft. (NGVD). The piezometer construction shall consist of PVC riser pipe and screen (ASTM 1785, Schedule 40). The piezometer located at the centerline of the levee will become a permanent piezometer and property of the Memphis District. Care shall be taken during construction to ensure that the piezometer is not damaged. The other two piezometers will be removed after the completion of the pumping station structure. See paragraph 3.2 for submittal and approval of piezometer details and installation procedures. The

Contractor shall make a minimum of one reading per piezometer, per 24-hour period, a minimum of 20 hours apart, based on a 7-day week. These piezometer readings, along with corresponding river stage readings, shall be recorded on an approved form and reported to the Contracting Officer within 12 hours after they are obtained. If, in the opinion of the Contracting Officer, more frequent readings are required, the Contractor will be directed as to the number and time that these readings are required. If additional readings are directed, an equitable adjustment in the contract unit price for dewatering will be made.

(10) The system shall include mechanical means for measuring the effluent from each well as well as the total effluent of the dewatering system. Devices and technique used in measurement shall be acceptable to the Contracting officer. The Contractor shall make a minimum of one reading per instrument, per 24-hour period, a minimum of 20 hours apart, based on a 7-day week. These instrument readings, along with corresponding river stage readings, shall be recorded on an approved form and reported to the Contracting Officer within 12 hours after they are obtained. If, in the opinion of the Contracting Officer, more frequent readings are required, the Contractor will be directed as to the number and time that these readings are required. If additional readings are directed, an equitable adjustment in the contract unit price for dewatering will be made.

(11) The system shall be designed, installed and operated in a manner which will preclude removal of materials from the foundation by the pumping operation (hereafter referred to as "sanding"). After installation, each well shall be individually pump-tested at maximum design flow to verify acceptability with respect to sanding. Any well or wellpoint segment found sanding at a rate exceeding one pint per 25,000 gallons of effluent during the individual pump-test of maximum design flow shall be replaced in a manner acceptable to the Contracting Officer, and at no additional cost to the Government.

(12) The rate of unwatering the excavation shall not exceed 5 feet per day for the first 10 feet and one foot per day thereafter until completely unwatered.

(13) The maximum rate of rise in flooding or rewatering the excavation shall be one foot per day until the water surface reaches elevation 303, and then 2 feet per day thereafter until completely flooded. (Provisions and requirements for emergency flooding are given in paragraph 3.3 OPERATION, below).

(14) The contractor has the option of using the permanent relief wells as specified in SECTION 02708 for dewatering. However, all criteria shall be met during the installation of the relief well(s) as specified by the plans and specifications before the well(s) can be used for dewatering during construction. After the dewatering system is no longer needed, the relief wells shall be rechecked and shall be required to meet all criteria as stated above. If the relief well(s) does not meet the requirements according to plans and specifications, then a new relief well shall be installed as directed by the COR and at no additional costs to the government.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 INITIAL TESTING

Upon installation of the system, the Contractor shall test and evaluate the completed system to demonstrate to the satisfaction of the Contracting Officer that the system is, in fact, capable of performing the intended dewatering operation as outlined herein. This testing shall include complete falling head tests to be conducted on each piezometer.

3.2 REVIEW OF SYSTEM DESIGN AND PERFORMANCE

The Contractor shall submit to the Contracting Officer, for review, details of his proposed dewatering facilities, including the type of system, planned layout and sizes of wells, headers, including all lengths requiring burial, collectors, ditches, piezometers, sumps and pumps; capacities of standby pumping and power supply facilities; number, type, location, proposed method of installation, and proposed methods of testing of piezometers; facilities for measuring the flow of water pumped from each well of the dewatering system; facilities for monitoring of sanding; provisions for disposal of water riverside of the mainline levee from the dewatering system; and plan of operation including flooding and rewatering plans. This submittal shall include the design capacity of each well at the design stage, and shall be submitted no later than 30 days prior to installation of the system. The Contractor's proposed dewatering facilities will be reviewed for general design concept, gross capacity at design stages, and flooding and rewatering plans. The Contractor retains full responsibility for design, installation, operation and performance of the system, facilities, and its components. The Contractor shall install the entire dewatering system and shall make no reduction to the planned system without the prior written approval of the Contracting Officer. If during the progress of the work, the installed dewatering system proves inadequate to meet the requirements specified, including piezometers, the Contractor shall, at his expense, furnish, install and operate such additional dewatering facilities and/or make such changes, either in features of the system or the plan of operation, as may be necessary to perform the required dewatering in a satisfactory manner. Such changes and additions shall be approved in writing by the Contracting Officer prior to being made.

3.3 OPERATION

The Contractor will be required to perform such dewatering and to maintain the work areas in a dry condition as long as is necessary for the work under this contract. Once an area is dewatered, it shall be maintained in a dewatered condition until all work in that area is completed, unless emergency flooding is directed or approved by the Contracting Officer. In the event that emergency flooding is deemed necessary, the protected area shall be flooded in

accordance with the sequence of emergency flooding proposed by the Contractor and approved by the Contracting Officer. However, the Contractor shall not flood the protected areas without approval to do so by the Contracting Officer. If emergency flooding is directed by the Contracting Officer, based on a predicted excessive river stage, the Contractor will be compensated for damages to permanent work in accordance with the "Damage to Work" clause in the Special Clauses. Also, an equitable adjustment will be made in the contract for repair of damages to the cofferdam and dewatering systems provided such damages are not due to the fault or negligence of the Contractor. However, all costs resulting from flooding necessitated because of the Contractor's fault, negligence or convenience will be borne by the Contractor. If flooding is directed by the Contracting Officer for reasons other than those above all extra costs will be borne by the Government and an equitable adjustment in the contract price will be made for the costs in accordance with the CONTRACT CLAUSE entitled "Changes".

### 3.4 MAINTENANCE AND SERVICING

The Contractor shall be responsible for the maintenance, servicing and repairs of the entire dewatering system and appurtenances during the life of the contract, including replacement of any and all wells, and piezometers found performing unsatisfactorily.

### 3.5 STANDBY PUMPING EQUIPMENT POWER

The Contractor shall furnish standby pumping equipment power as follows:

- (1) Diesel or liquid petroleum gas prime movers for pumps shall have 50% standby equipment.
- (2) Portable electric generators shall have 100% connected standby equipment.
- (3) Commercial electric power, if available, shall have 100% standby electric generating equipment.

### 3.6 REMOVAL

The dewatering facilities required to maintain a dry condition within the protected area shall be maintained until completion of the work within the protected area, and then shall be completely removed. However, no dewatering facilities of any kind shall be removed without prior approval of the Contracting Officer. All wells, pumps and appurtenances employed in the dewatering system and all materials other than earth shall remain the property of the Contractor, and shall be removed by him from the site of the work. All holes shall be plugged as follows: The riser pipes for all wells and piezometers shall be completely removed and filled with bentonite-cement grout. However, the screens of the deep well system may remain upon approval of the Contracting Officer. Plugging shall be accomplished by inserting a

grout pipe to the full depth of the well or riser pipe and the grout either poured or pumped in as the riser pipe is removed. The grout for plugging the hole shall consist of a mixture of portland cement, bentonite, and water proportioned as directed by the Contracting Officer. The water percentage may be varied for a more effective plugging job. The grouting of abandoned wells and piezometer riser pipes in lieu of removing them will not be permitted unless approved by the Contracting Officer.

--End of Section--

DIVISION 2 - SITE WORK

SECTION 02221

EXCAVATION

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DIVISION 2 - SITE WORK

SECTION 02221

EXCAVATION

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, equipment, and materials, and performing all operations necessary for inlet and outlet channel excavation; structural excavation; and excavation for placement of the discharge pipes and appurtenances; all as indicated on the drawings and/or specified herein. Excavation incidental to the installation of the dewatering systems is covered in SECTION 02220 - DEWATERING.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Excavation

Layout, bottom widths, side slopes, transitions, disposition of materials.

(2) Slides

Locations, limits, method and equipment used where remedial work has been directed.

(3) Removal of Sediments

Location, limits, removal, disposition of materials.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 EXCAVATION

3.1.1 GENERAL

The Contractor shall excavate and remove all material of whatever nature encountered as may be necessary to excavate the inlet and outlet channels and structural excavation areas including excavation necessary to place the stone protection as indicated, and the foundation for the discharge pipes; all to the lines and grades indicated therefor on the drawings. Excavation for installation of the discharge pipe appurtenances shall be directed or approved by the Contracting Officer. The Contractor shall also perform excavation as necessary to remove unsuitable material below the structural excavation lines and grades to the elevations directed by the Contracting Officer. Excavation may be performed with any type of equipment suitable for the work. The methods employed shall be such that will not induce slides or dislodgment of foundation material, and that do not endanger the safety of personnel. The volume of material removed below the indicated bottom grade for structural excavation, as directed by the Contracting Officer, will be paid for at the contract unit price per cubic yard for "Excavation." Any excavation below the grades shown on the drawings for structural excavation or below the grades directed by the Contracting Officer, shall be refilled with backfill material as approved by the Contracting Officer and as specified in SECTION 02222 - BACKFILLS AND EMBANKMENT at the expense of the Contractor and no payment will be made therefor. Areas resulting from directed excavation below structural excavation lines and grades shall be refilled with either impervious or pervious backfill material as specified in SECTION 02222 - BACKFILLS AND EMBANKMENT, and such refill will be paid for at the contract unit price per cubic yard for either "Impervious Backfill" or "Pervious Backfill". The above requirements are modified to the extent that a vertical tolerance of 4 inches above or below the theoretical cross sections will be allowed for inlet and outlet channel excavation outside the structural excavation areas provided that the theoretical cross-sectional areas are obtained, that the finished lines and grades are free from abrupt changes, and that the drainage pattern indicated on the drawings is maintained. A tolerance of 2 inches above or below the theoretical cross section will be allowed in the structural excavation and excavation for the placement of the discharge pipes outside the actual foundations for the structures and discharge pipes. The finished lines of the inlet and outlet channels shall conform to the top elevation of the riprap at and in the vicinity of the junction of such surfaces. Excavation of the inlet channel shall not be performed closer to the pumping station prior to removal of the inlet structure cofferdam than indicated on the drawings.

3.1.2 EMBEDMENT OF RIPRAP

The Contractor shall excavate, in areas where filter fabric and riprap are required, in such a manner that the filter fabric and riprap are placed beneath the theoretical cross section as indicated on the drawings. Tolerances for such excavation shall be subject to the tolerances for filter fabric and riprap as specified in SECTION 02542, paragraphs 3.2 and 3.3. The finished grade of the adjacent channel excavation shall conform to the finished riprap grade at and in the vicinity of the junctions of these surfaces.

## 3.2 DISPOSTION OF MATERIALS

### 3.2.1 Suitable Materials

Suitable materials from the excavations prescribed in this section shall be utilized to the extent required for constructing prescribed backfills and embankment, including the cofferdams, but exclusive of impervious material which is defined in SECTION 02222 - BACKFILLS AND EMBANKMENT. Such materials from the excavations may be placed directly in the cofferdams and the permanent work when such procedure is practicable. Where direct placement is not practicable, suitable material from the excavations may be stockpiled in the excess excavated material deposit areas, indicated on the drawings, except that material from the excavation for placement of the discharge pipes may be stockpiled on the existing levee; all for subsequent use in parts of the work for which it is suitable. The method and location of stockpiling material must meet the approval of the Contracting Officer. Suitable materials in excess of the quantity necessary to construct the various backfills and embankments shall be disposed of as specified for unsuitable materials in 3.2.2 below.

### 3.2.2 Unsuitable Materials

Material for the excavations prescribed in this section which are not suitable for incorporation in the backfills and embankments shall be permanently disposed of in the excess excavated material deposit area indicated on the drawings. All material ultimately left in the deposit areas shall be spread to a uniform depth in accordance with the lines and grades shown on the drawings. The material shall be dressed as shown on the drawings so as to produce smooth surfaces and in such manner that drainage will result as indicated on the drawings. Finished appearance of the material shall meet the approval of the Contracting Officer. Compaction of material placed in the deposit areas will not be required except that obtained by necessary dressing operations.

### 3.2.3 Temporary Ramps

The Contractor will be permitted to construct ramps over the levee at his expense, for transportation of material. Such ramps and the location thereof shall be subject to the approval of the Contracting Officer and the provisions of SECTION 00800, paragraph 1.34. When the ramps are no longer needed they shall be removed and the material therefrom shall be disposed of as specified in 3.2.1 and/or 3.2.2 above. Areas formerly occupied by the ramps shall be fertilized and sodded at the Contractor's expense and to the satisfaction of the Contracting Officer.

## 3.3 SLIDES

In case sliding occurs in any part of the excavations prescribed in this section after they have been excavated, but prior to final acceptance of all work under the contract, the Contractor shall repair the slide as directed the Contracting Officer. In case the slide is caused through the fault of the Contractor, it shall be repaired at no cost to the Government. In case the slide is due to no fault of the Contractor, an equitable adjustment in the

contract price will be made for the repairs in accordance with the provisions of Clause 3, "Changes'" of the General Provisions.

#### 3.4 SEDIMENTS

Prior to final acceptance of all work under the contract, the Contracting Officer may require removal of sediments from the inlet and outlet channels as necessary to restore them to grade and section. The volume of material removed will be paid for at the contract unit price per cubic yard for "Excavation."

-- End of Section --

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SECTION 02222

BACKFILLS AND EMBANKMENT

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DIVISION 2 - SITE WORK

SECTION 02222

BACKFILLS AND EMBANKMENT

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, equipment, and materials except earth materials but including pervious backfill materials, and performing all operations in connection with construction of pervious backfill, impervious backfill, cofferdams, and permanent embankment on each side of the inlet channel; all as indicated on the drawings and/or specified herein. Backfill around and over the discharge pipes and appurtenances shall be considered as impervious backfill, except that portion designated on the drawings as pervious backfill. Permanent embankment on each side of the inlet channel as referred to in this section does not include material placed in the excavated material disposal area.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

- (1) Equipment  
Type, size, suitability.
- (2) Backfills and Embankment  
Layout, limits, type, materials, slopes, compaction, cross section, tolerances.
- (3) Cofferdams  
Layout, limits, placement, grade and section, tolerance, compaction, suitability of materials, removal and disposal of materials.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issue listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS

D 698-91	Compaction Characteristics of Soil using Standard Effort (12,400 ft - lbf/ft <sup>3</sup> (600 kn.-M/M <sup>3</sup> )) Effort
D 1556-90 (R 1996)	Density and Unit Weight of Soil in Place by the Sand-Cone Method
D 2216-92	Laboratory Determination of Water (Moisture) Content of Soil and Rock
D 2487-93	Classification of Soils for Engineering Purposes (Unified Soil Classification System)
D 2922-91	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 3017-88 (R 1993)	Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
D 4253-93 (R 1996)	Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
D 4254-91 (R 1996)	Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
E 329-95c	Agencies Engaged in the Testing and/or Inspection of Materials in Construction

1.4 EQUIPMENT

Equipment shall be of types suitable for construction of the prescribed backfills and embankment, subject to the provisions as specified in paragraph 3.1.3 below.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 BACKFILLS AND EMBANKMENTS

3.1.1 GENERAL

All backfills and embankment shall be placed to the lines, grades, and sections as indicated therefor on the drawings; however, the right is reserved to increase the backfill cross sections as may be necessary to compensate for later shrinkage and settlement. A tolerance of two-tenths of

a foot above or below grade will be allowed in the placement of the backfills and embankment except the cofferdams, except where structures are placed upon the backfills, and unless otherwise directed by the Contracting Officer. A tolerance of five-tenths of a foot above grade will be permitted in the construction of the cofferdam embankment provided that any excess material is so distributed that the crown of the cofferdam drains, and that there are no abrupt humps or depressions in surfaces or bulges in the width of the crown, and the side slopes are uniform. No brush, tree roots, sod or other objectionable material shall be placed in the backfills and embankment. The Contractor will be required, when directed, to remove any materials which the Contracting Officer considers to be objectionable in the backfills or embankments. The suitability of each section of the foundation for placing materials thereon will be determined by the Contracting Officer. No backfill or embankment shall be placed on or against concrete less than 14 days old, without prior approval of the Contracting Officer. Until removal is authorized and subject to the provisions of SECTION 02220 - DEWATERING, the Contractor shall perform such maintenance on the cofferdams as necessary to insure that the integrity of the cofferdams is not impaired and that the cofferdams are maintained to full grade and section.

### 3.1.2 MATERIALS

#### 3.1.2.1 PERVIOUS BACKFILL

Pervious backfill shall be sand conforming to the requirements for fine aggregate for concrete as specified in SECTION 03300 - CAST-IN-PLACE STRUCTURAL CONCRETE.

#### 3.1.2.2 IMPERVIOUS BACKFILL, COFFERDAMS, AND PERMANENT EMBANKMENT ON EACH SIDE OF INLET CHANNEL

Material for the impervious backfill, cofferdams and permanent embankment on each side of the inlet channel shall be selected material from the required excavations. Any suitable material from such sources, classifying under the Unified Soil Classification System (as shown on the Soil Boring Legend) as clay, sandy clay, silty clay, or clayey sand, that conforms to the general requirements specified in 3.1.1 above, and that is stable when compacted may be used for such backfill and embankment.

### 3.1.3 PLACEMENT

#### 3.1.3.1 PERVIOUS BACKFILL, IMPERVIOUS BACKFILL, AND PERMANENT EMBANKMENT

Pervious backfill, impervious backfill, and permanent embankment on each side of the inlet channel shall be placed in layers not exceeding 8 inches in thickness prior to compaction, except that where compaction by mechanical hand tamps is required the layers shall not exceed 6 inches in thickness prior to compaction, and except that in the immediate vicinity of and around the concrete slab for the fuel storage tank placement shall be as recommended by the tank manufacturer. The materials may be spread by any approved equipment in horizontal layers and each layer shall be compacted as specified in 3.1.4.1 or 3.1.4.2 below, as applicable. At least a one foot thickness of the pervious backfill in the areas upon which concrete structures will be constructed shall be placed after structural excavation but prior to drying out of base clay material. Self-propelled vibratory equipment may be used only on pervious backfills. Crawler-type tractors, tamping rollers, vibratory equipment and other similar compaction equipment shall not be used

within 2 feet of any completed or partially completed structure. Compaction within 2 feet of completed or partially completed structures shall be accomplished by the use of mechanical hand tamps or other approved methods and equipment. The Contractor shall perform standard compaction tests to determine optimum water contents and maximum densities and will perform field density and water content tests as acceptance tests; however, the Contractor shall perform field density and water content tests on each layer of each type of material placed to assure that proper compaction is being achieved. It is expected that at least one test per lift will be required.

#### 3.1.3.2 COFFERDAM EMBANKMENT

Cofferdam embankment shall be placed or spread in layers not exceeding 12 inches in thickness prior to compaction and shall be compacted as specified in 3.1.4.3 below; however, that portion of the inlet structure cofferdam which lies within the limits of the permanent embankment on each side of the inlet channel shall be placed as specified in 3.1.3.1 above and compacted as specified in 3.1.4.2 below, and such portion of the cofferdam shall remain in place and become a part of the permanent embankment. Immediately prior to placement of the fill material, the entire earth surface on or against which fill is to be placed shall be thoroughly broken to a depth of 6 inches.

#### 3.1.4 COMPACTION

##### 3.1.4.1 PERVIOUS BACKFILL

Each layer of the fill shall be compacted to a density of at least 95 percent of the laboratory density obtained by the standard density test (ASTM D 698). The field density determination shall be by the Sand-Cone Method (ASTM D 1556) or the Nuclear Method (ASTM D 2922, Method B). The moisture content after compaction for the compacted impervious backfill shall be within the limits of three (3) percentage points from optimum moisture content as determined by the Contractor in accordance with ASTM D 698. The field moisture content shall be determined by the Contractor according to ASTM D 2216 or ASTM D 3017. The materials may require moistening or aerifying as necessary to provide the above specified moisture content. Moisture control of the compacted pervious backfill will not be required. The Contractor shall perform standard density tests (ASTM D 698) to determine optimum water contents and maximum densities for each type of material used in the fill. The Contractor shall perform field density and water content tests on each layer of material placed to assure that proper compaction is being achieved. The location where the contractor is to take field density and water content tests shall be as specified by the Contracting Officer.

##### 3.1.4.2 IMPERVIOUS BACKFILL AND PERMANENT EMBANKMENT ON EACH SIDE OF THE INLET CHANNEL

Each layer of impervious backfill and each layer of permanent embankment placed on each side of the inlet channel shall be compacted to a density of at least 95 percent of the laboratory density obtained by the density test ASTM D 698. The field density determination shall be by the Sand-cone Method ASTM D 1556 or the Nuclear Method (ASTM D 2922 Method B). The moisture content after compaction shall be within the limits of 2 percentage points above optimum and 3 percentage points below optimum moisture content as determined by the Contracting Officer in accordance with ASTM D 698. The

field moisture content after compaction shall be performed in accordance with ASTM D 2216 or ASTM D 3017. The materials may require moistening or aerifying as necessary to provide the above specified moisture content. The Contractor shall perform field density and water content tests on each layer of material placed to assure that proper compaction is being achieved. The location where the contractor is to take field density and water content tests shall be as specified by the Contracting Officer.

#### 3.1.4.3 COFFERDAMS

Except as specified in 3.1.3.2 above, each layer of cofferdam embankment shall be compacted by at least three passes of a crawler-type tractor weighing not less than 20,000 pounds, exerting a unit tread pressure of not less than 6 pounds per square inch, and operated at a speed not exceeding 3.5 miles per hour. Compaction may also be accomplished by other approved equipment as specified in 3.1.4.4 below. A pass shall consist of one complete coverage of the surface of a layer by the treads of the tractor or other compacting equipment.

#### 3.1.4.4 ALTERNATIVE COMPACTION EQUIPMENT

The Contractor may propose for use alternative types of compaction equipment not included in these specifications, for compaction of the cofferdam embankment. The suitability of the alternative equipment must be demonstrated to the Contracting Officer by a field test conducted by and at the expense of the Contractor. The alternative compaction equipment must be capable of properly compacting the soil so that no planes of weakness or laminations are formed in the fill. The field test shall consist of compacting a minimum of three layers of an area of embankment with the alternative type equipment. Testing and inspection of the area shall then be performed by the Contractor at no additional cost to the Government. Procedures for constructing and testing the area will be provided by the Contracting Officer. Each proposed alternative type of equipment must be capable of compacting a layer of soil at least 12 inches thick. A minimum of four complete passes over each layer of the test fill will be required for each type of alternative equipment that is allowed for use, unless in the course of constructing the test fill the Contractor is able to demonstrate that proper compaction can be obtained with fewer passes. Alternative type equipment shall be operated at speeds not to exceed 3.5 miles per hour.

#### 3.1.5 3" LAYER OF GROUT

##### 3.1.5.1 General

A 3" layer of grout shall be constructed to the lines and grades as shown on the drawings under the pumping station structure and the outfall structure, using a non-reinforced grout mixture with a compressive strength of 3000 psi at 28 days. The grout layer shall be protected from workmen, loads, rain, flowing water, and mechanical injury for a period of at least 24 hours.

##### 3.1.5.2 Grout Mixture Proportions

Grout mixture proportions shall be determined by the Contractor and submitted for approval. The proportions of all ingredients and nominal maximum coarse aggregate size that will be used in the manufacture of the grout shall be stated. Proportions shall indicate weight of cement and water and weight of aggregates in a saturated surface-dry condition. The submission shall be

accompanied by test reports from a laboratory complying with ASTM E 329 which show that proportions thus selected will produce grout of the quality indicated. No substitution shall be made in the source or type of materials used in the work without additional tests to show that the new materials and quality of grout are satisfactory.

#### 3.1.6 SLIDES

In the event of sliding of any part of the backfills or embankments including cofferdams during their construction, or after their completion, but prior to acceptance of all work under the contract, the Contractor shall upon written order of the Contracting Officer, repair the slide as directed. In case the slide is caused through fault of the Contractor, repairs shall be performed without cost to the Government. In case the slide is due to no fault of the Contractor, an equitable adjustment in the contract price will be made for its repair in accordance with Clause 3, "Changes," of the General Provisions.

#### 3.1.7 REMOVAL OF COFFERDAMS

After the cofferdams have served their purpose and removal is authorized by the Contracting Officer, they shall be removed by the Contractor, except as provided in 3.1.3.2 above. The areas after removal of the embankment shall be graded and smoothed so as to leave relatively smooth surfaces that will be compatible with adjacent surfaces. Materials removed shall be disposed of as specified for suitable and unsuitable materials, as applicable, in SECTION 02221 - EXCAVATION.

-- End of Section --

DIVISION 2 - SITE WORK

SECTION 02350

STEEL SHEET PILING

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DIVISION 2 - SITE WORK

SECTION 02350

STEEL SHEET PILING

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, equipment, labor and materials, and performing all operations in connection with the installation of steel sheet piling in accordance with these specifications and applicable drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with the contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Materials

Properties, type, quality, certificates.

(2) Driving

Placement, alignment, elevations, splicing, interlocks.

(3) Pile Tops

Elevations, cut-offs, treatment, splices of below grade tops.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government daily.

### 1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS

A 328/A 328M-93a            Steel Sheet Piling  
R 1996

#### AMERICAN WELDING SOCIETY, INC. (AWS) CODE

D1.1-94                    Structural Welding Code Steel

#### FEDERAL SPECIFICATIONS (FED. SPEC.)

SS-C-153C                Cement, Bituminous, Plastic

TT-S-00227E(3)        Sealing Compound: Elastomaic Type, Multi-Component  
(For Caulking, Sealing, and Glazing in Buildings and  
other Structures

### 1.4 SUBMITTALS

#### 1.4.1 Equipment Descriptions

The Contractor shall submit complete descriptions of pile driving equipment, including hammers, extractors, protecting caps and other appurtenances to the Contracting Officer for information only prior to commencement of work.

#### 1.4.2 Certificate

The Contractor shall furnish the Contracting Officer a certificate showing that piling furnished has the required interlock strength as determined by test results of two representative test specimens, approximately 3 inches long, per heat. The certificate shall indicate piling type, dimensions and section properties. The certificate shall be submitted for information only.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Steel for sheet piling shall conform to the requirements of ASTM A 328. Sheet piling, including special fabricated sections, shall be of the type indicated on the drawings, have a nominal web thickness of not less than 3/8-inch and be of a design such that when in place they will be continuously interlocked throughout their entire length. Welded connections shall conform to the requirements of AWS D1.1. Piling shall have the properties equivalent to those listed in the following table:

PROPERTIES OF SECTIONS

Type of Section	Nominal Web Thickness (Inches)	Section Modulus Per Lin. Ft. of Wall (In-Cu)	Weight Per Sq. Ft. of Wall (lbs.)	Weight Per Lin Ft. of Pile	Minimum Interlock Strength in Tension (Lbs Per) Lin In)
PSA 23*	3/8	2.4	23.0	30.7	12,000
PZ 27*	3/8	30.2	27.0	40.5	--

\*Cold-rolled sections with equivalent properties may be used.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Placing and Driving

##### 3.1.1.1 Placing

Piling shall be placed to the line and elevations as shown on the drawings. Piles shall be placed in a plumb position with each pile interlocked with adjoining piles for its entire length. Interlocks shall be properly engaged with the thumb of each pile gripped by the thumb and finger of the adjacent pile. Suitable temporary wales or guide structures shall be provided to insure that the piles are driven to correct alignment.

##### 3.1.1.2 Driving

All piles shall be driven to at least the depths shown on the drawings and shall extend to the elevation indicated for the top of the piles. A tolerance of +/- 1/2 inch above or below the indicated top elevation will be permitted. Piles shall be driven by approved methods in such manner as not to subject the piles to serious damage and to insure proper interlocking throughout the length of the piles. All pile driving shall be performed using a vibratory hammer. Pile hammers shall be maintained in proper alignment during driving operations by use of suitable leads or by guides attached to the hammer. A

protecting cap shall be employed in driving, when required, to prevent damage to the tops of piles. All piles shall be driven without the aid of a water jet, unless otherwise authorized. Adequate precautions shall be taken to insure that piles are driven plumb. If at any time the forward or leading edge of the piling wall is found to be out of plumb in the plane of the wall, the piles already assembled and partly driven shall be driven to full depth and the Contractor shall provide and drive tapered piles to interlock with the out of plumb leading edge or take other corrective measures to insure the plumbness of succeeding piles. The maximum permissible taper for any tapered pile will be one-eighth of an inch per foot of length. Each run of piling shall be driven to grade progressively from the start and no pile shall be driven to a lower grade than those behind it in the same run except when the piles behind it cannot be driven deeper. If the pile next to the one being driven tends to follow below final grade, it may be pinned to the next adjacent pile. Should boulders or other obstructions render it impracticable to drive a pile to the specified penetration, the Contractor shall make such changes in design alignment of the pile structure as may be deemed necessary by the Contracting Officer to insure the adequacy and stability of the structure. Payment for the additional labor and materials necessitated by such changes will be made at the applicable contract prices. Piles driven out of interlock with adjacent piles or otherwise damaged shall be removed and replaced by new piles at the Contractor's expense. Piles shall not be driven within 100 feet of concrete less than 7 days old.

### 3.1.2 Cutting and Splicing

Piles extending above grade shall be cut off to required grade. Piles driven below the elevations indicated for the top of piles and piles which because of damaged heads have been cut off to permit further driving, and are then too short to reach the required top elevation, shall be extended to the required top elevation by welding an additional length, when directed, without cost to the government. Should splicing of piles be necessary, the splice shall be made by an approved butt weld making full penetration of the web. Piles adjoining spliced piles shall be full length piles. The Contractor shall trim the tops of piles excessively battered during driving, when directed to do so. Cut-offs shall become the property of the Contractor and shall be removed from the work.

### 3.1.3 Pulling and Re-Driving

The Contractor may be required to pull certain selected piles after driving, for test and inspection, to determine the conditions of the piles. Any pile so pulled and found to be damaged to such extent as would impair its usefulness in the structure shall be removed from the work and the Contractor shall furnish and drive a new pile to replace the damaged pile. Piles pulled and found to be in a satisfactory condition shall be redriven.

### 3.2 MISCELLANEOUS ITEMS

- (a) After the PSA 23 piles are driven, the handling holes shall be plugged by welding to the piling a 1/8-inch thick steel plate of sufficient size to cover the hole, or by other effective means.
- (b) The tops of PSA 23 piling embedded in concrete shall be coated with bituminous material conforming to Fed. Spec. SS-C-153, Type I, Class A or B, and such bituminous material shall also be used to provided a bond breaker between concrete in the cavities of the PZ 27 piling and other concrete.
- (c) Blockouts in concrete in which sides of PZ 27 piling are to be installed shall be filled with an elastomeric type, multi-component sealing compound conforming to Fed. Spec. TT-S-00227, Type II, Class A, in a manner as recommended by the manufacturer of the sealing compound.

### 3.3 TREATMENT OF PILE TOPS

Handling holes in piling shall be plugged by welding to the piling a 1/8-inch thick steel plate of sufficient size to cover the hole. The tops of the piles shall be cut off by sawing or burning to conform to the slope or grade indicated on the drawings.

-- End of Section --

DIVISION 2 - SITE WORK

SECTION 02400

WALL DRAIN SYSTEM

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DIVISION 2 - SITE WORK

SECTION 02400

WALL DRAIN SYSTEM

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all labor, equipment and material, and performing all operations necessary for the construction of a complete wall drain system, and all other work incidental thereto as specified herein and/or indicated on the drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Materials

Suitability for use, compliance with specified requirements.

(2) Installation

Location, grades, elevations, thickness, compaction, methods of compaction.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of the specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM).

A 36/A36M-96	Carbon Structural Steel
B 209-96	Aluminum and Aluminum-Alloy Sheet and Plate
B 221-96	Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)

D 3034-96

Type PSM Poly (Vinyl Chloride) (PVC)  
Sewer Pipe and Fittings

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 PVC Pipe

PVC pipe shall conform to the requirements of ASTM D 3034 and be perforated as shown on the drawings.

2.1.2 Geotextile

Geotextile shall conform to requirements as specified in SECTION 02215.

2.1.3 Washed Gravel Backfill

Washed gravel backfill shall conform to the following requirements:

The washed gravel backfill material shall be composed of tough, durable particles, shall be reasonably free from thin, flat and elongated pieces, and shall contain no organic matter nor soft, friable particles. Grading shall conform to the following requirements:

U.S. Standard Sieve No.	Permissible Limits Percent by Weight, Passing
3-inch	100
1-1/2-inch	85-100
3/4-inch	35-70
3/8-inch	5-40
No. 4	0-5

The material shall be well-graded between the limits shown. The Contractor shall furnish a representative sample of the material and the Contractor shall perform gradation tests. All points on individual grading curves obtained from representative samples of filter material shall lie between the boundary limits as defined by smooth curves drawn through the tabulated grading limits plotted on a mechanical analysis diagram. The individual grading curves within these limits shall not exhibit abrupt changes in slope denoting either skip grading or scalping of certain sizes or other irregularities which would be detrimental to the proper functioning of the filter. The material shall be furnished by the Contractor from off-site sources.

2.1.4 Shop Drawings

The Contractor shall furnish for approval shop drawings showing the materials used, specifications, dimensions, brochures, fabrication and/or supplies. For the following items In-Line check valve assembly and the 6" check valve; how installed, bolts and fasteners to be used; the 6" steel pipe to pass through the concrete wall, how the connection is made to the 6" check valve and the PVC pipe.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1. Geotextile (Filter Fabric)

Geotextile (Filter Fabric) conforming to the requirements of SECTION 02215 - GEOTEXTILE shall be placed as shown on the drawings around the gravel in which the PVC pipe is buried as shown on the drawings.

3.1.2 Washed Gravel Backfill

The washed gravel backfill material shall be placed around the PVC pipe as indicated on the drawings.

3.1.3 Pipe and Fittings

Pipe and fittings shall be placed at the location and to the lines and grades indicated therefor on the drawings. Pipe connections shall be carefully made as recommended by the materials manufacturer.

--End of Section--

DIVISION 2 - SITE WORK

SECTION 02542

STONE PROTECTION

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DIVISION 2 - SITE WORK

SECTION 02542

STONE PROTECTION

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all plant, labor, equipment and materials, and performing all operations in connection with the construction of the stone protection, including foundation preparation, placement of filter material, and placement of riprap and grouting, all in accordance with these specifications and the contract drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in the section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Foundation

Preparation (line and grade).

(2) Inspection

At the worksite to ensure use of specified materials.

(3) Riprap

Gradation and placement.

(4) Grouting

Mixture and Placement

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATION

The following publication of the issue listed below, but referred to thereafter by basic designation only, forms a part of this specification to the extent



of any stone to the site of the work. Samples shall consist of at least 7 pieces of stone, roughly cubical in shape and weighing not less than 100 pounds each. All such samples shall be taken by the Contractor under the supervision of the Contracting Officer. The samples shall be shipped at the Contractor's expense to the Waterways Experiment Station, Vicksburg, Mississippi, at least 60 days in advance of the time the placing of the stone is expected to begin. The tests will be conducted in accordance with applicable Corps of Engineers methods of tests given in the Handbook for Concrete and Cement, and will be performed at the Waterways Experiment Station, Vicksburg, Mississippi. The cost of testing will be borne by the Government.

### 2.1.3 Gradation

Gradation shall conform to the table below and to Plate I at the end of this section and format thereof shall be as shown. Neither the width nor the thickness of any piece shall be less than one-third of its length. An allowance of 5 percent by weight for inclusion of quarry spalls will be permitted. Stone shall be reasonably well graded between the largest and smallest pieces. The table below describes the upper and lower limit curves for the riprap gradation.

The graph of the riprap with the limit curves plotted thereon is inserted at the end of this section as Plate I.

TABLE I  
(For Riprap "R 140")

<u>Percent Lighter by Weight (SSD)</u>	<u>Limits of Stone Weight, lb.</u>
100	140-60
50	60-30
15	30-10

### 2.1.4 Test Method

Gradation test method shall conform to the requirements of "LMVD Standard Test method for Gradation of Riprap" which is inserted at the end of this section as PLATE II; an Example Gradation and Worksheet, an Example Gradation Sheet, and example Gradation Test Data Sheet; all inserted at the end of this section as Plates III, IV and V.

### 2.1.5 Gradation Test

The Contractor shall perform a gradation test or tests on the riprap at the quarry. At least one gradation test shall be performed. The sample shall be taken by the Contractor under the supervision of the Contracting Officer, shall consist of not less than 15 tons of riprap and shall be collected in a random manner which will provide a sample which accurately reflects the actual gradation

arriving at the jobsite. If collected by the truckload, each truckload shall be representative of the gradation requirements. The Contractor shall provide all necessary screens, scales and other equipment, and the operating personnel therefor, and shall grade the samples, all at no additional cost to the Government.

## PART 3 EXECUTION

### 3.1 RIPRAP

#### 3.1.1 General

Riprap shall be placed on the prepared base and/or filter material within the limits shown on the contract drawings. Riprap shall be as specified in 2.1 above.

#### 3.1.2 Placement

Riprap shall be placed in a manner which will produce a reasonably well-graded mass of rock with the minimum practicable percentage of voids, and shall be constructed, within the specified tolerance, to the lines and grades indicated on the contract drawings. A tolerance of plus 6 inches and minus 3 inches from the required finished surface of the riprap will be allowed provided these extremes do not occur adjacent to each other, and that neither extreme exists over more than 10 percent of the total area. Riprap shall be placed to its full course thickness in one operation and in such manner as to avoid displacing the filter material. The larger stones shall be well distributed and the entire mass of stones in their final position shall be graded to conform to the gradation specified in 3.3.1 above. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Placing riprap in layers will not be permitted. Placing riprap by dumping it at the top of the slope and pushing it down the slope will not be permitted. The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the quarry or other source; by controlled dumping of successive loads during final placing; or by other methods of placement which will produce the specified results. Rearranging of individual stones by mechanical equipment or by hand will be required to the extent necessary to obtain a reasonably well-graded distribution of stone sizes as specified above. The Contractor shall maintain the riprap until accepted and any material displaced prior to acceptance and due to the Contractor's negligence shall be replaced at his expense and to the lines and grades indicated on the contract drawings.

### 3.2 GROUTING

#### 3.2.1 Placement

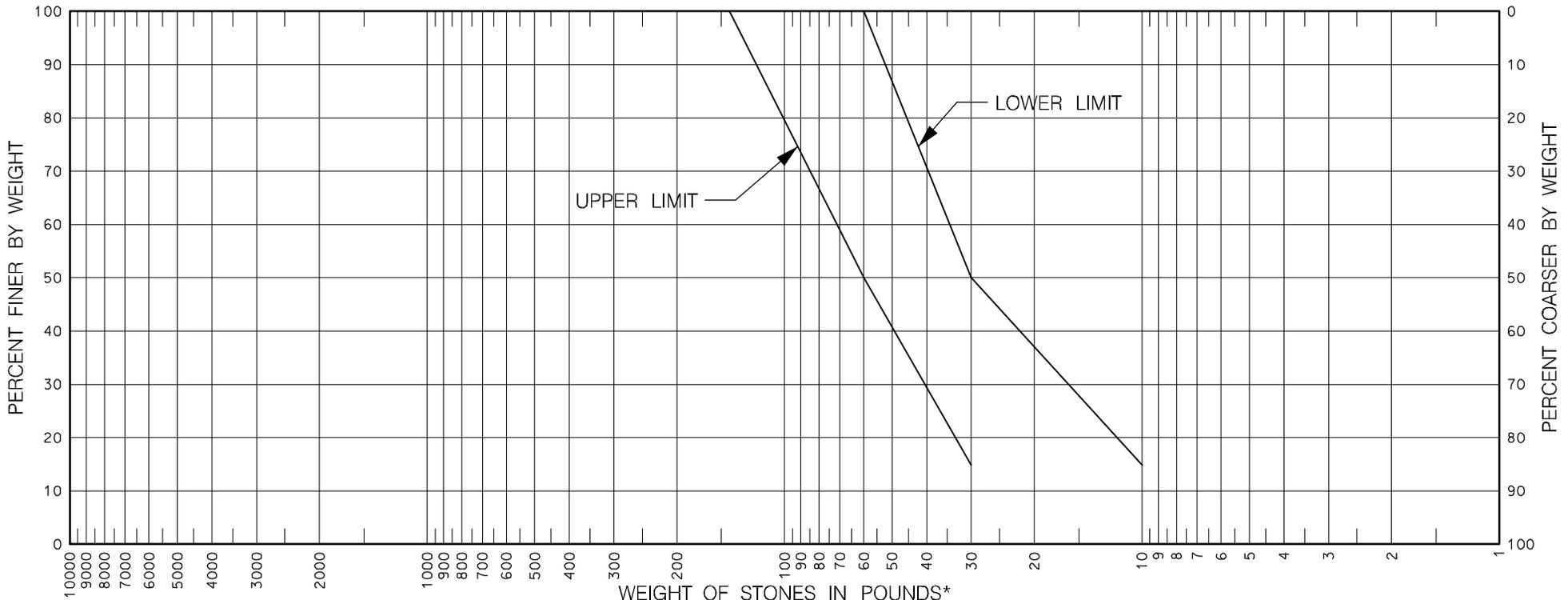
Portions of completed riprap paving as indicated on the drawings shall be

grouted. No grout shall be placed under water. The grout shall be mixed in a manner so as to produce a mixture having a consistency which will permit gravity flow into the interstices of the dumped riprap with the help of limited spading and brooming. The grout shall be used in the work within 90 minutes after mixing. Retempering of grout will not be permitted. Riprap shall not be grouted when the ambient temperature is below 40 degrees F or above 85 degrees F unless approved by the Contracting Officer in writing, nor when the grout, without special protection, is likely to be subjected to freezing temperatures before final set has occurred. Prior to grouting, all surfaces of riprap shall be wetted. The riprap shall be grouted in successive strips, approximately 10 feet in width, commencing at the lowest strip and working up the slope. Each batch of grout shall be dumped on the upper portion of the ungrouted part of the strip and worked into the voids between the stones and down the slopes. Grout shall be brought to the place for final deposit by approved means, and in no case shall grout be permitted to flow on the riprapped surface a distance in excess of 10 feet. Immediately after dumping a batch of grout, it shall be distributed over the surface of the strip by the use of brooms and the grout worked into place between stones with suitable spades and trowels. Adequate precautions shall be taken to prevent grout from penetrating the prepared base. As a final operation, the excess grout shall be removed from the top surfaces of the upper stones and from packets and depressions in the surface of the stone protection by use of a stiff broom having bristles resistant to water and capable of withstanding hard sweeping; and scrubbing. After completion of any strip as specified, no workman, nor any load, shall be permitted on the grouted surface for a period of at least 24 hours. The surface of all grouted riprap shall be protected from rain, flowing water and mechanical injury for a period of at least 24 hours. The surface of all grouted riprap shall be cured by keeping the surface continuously wet for a period of not less than 72 hours or by application of an approved curing compound.

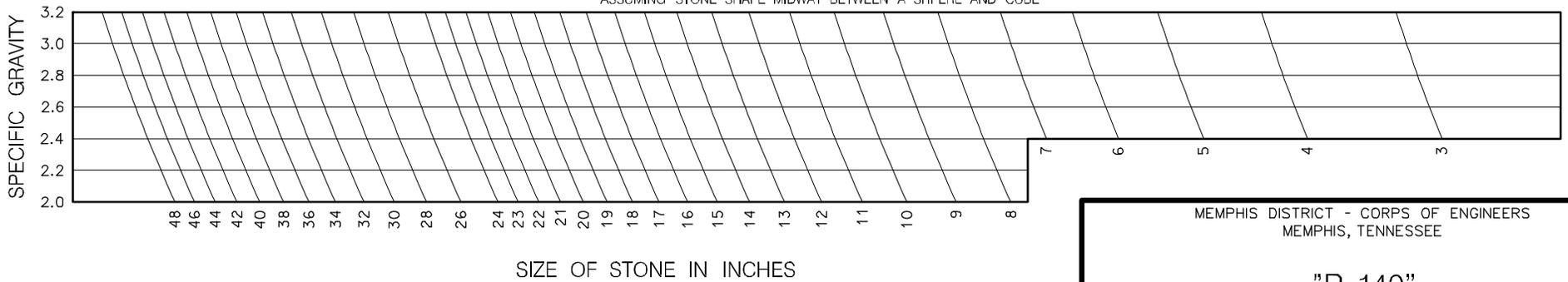
### 3.2.2 Maintenance

The Contractor shall maintain the grouted riprap until accepted, and any material displaced prior to acceptance and due to the Contractor's negligence shall be replaced at his expense and to the lines and grades shown on the contract drawings.

-- End of Section --



WEIGHT OF STONES IN POUNDS\*  
 SPECIFIC GRAVITY OF ROCK \_\_\_\_\_  
 \*ASSUMING STONE SHAPE MIDWAY BETWEEN A SHPERE AND CUBE



MEMPHIS DISTRICT - CORPS OF ENGINEERS  
 MEMPHIS, TENNESSEE

"R-140"

PROJECT: \_\_\_\_\_ DATE: \_\_\_\_\_

RIPRAP GRADATION CURVES

## LMVD STANDARD TEST METHOD FOR GRADATION

A. Select a representative sample (Note #1), weigh and dump on hard stand.

B. Select specific sizes (see example) on which to run "individual weight larger than" test. (See Note #2). Procedure is similar to the standard aggregate gradation test for "individual weight retained".

C. Determine the largest size stone in the sample. (100% size)

D. Separate by "size larger than" the selected weights, starting with the larger sizes. Use reference stones, identified weights, for visual comparison in separating the obviously "larger than" stone. Stones that appear close to the specific weight must be individually weighed to determine size grouping. Weigh each size group, either individually or cumulatively.

E. Paragraph D above will result in "individual weight retained" figures. Calculate individual percent retained (heavier than) and cumulative percent retained and cumulative percent passing (lighter than). Plot percent passing, along with the specification curve on ENG Form 4055.

### NOTES

1. Sample Selection. The most important part of the test and the least precise is the selection of a representative sample. No "standard" can be devised; larger quarry run stone is best sampled at the shot or muck pile by given direction to the loader; small graded riprap is best sampled by random selection from the transporting vehicles. If possible, all parties should take part in the sample selection and agree before the sample is run that the sample is representative.

2. Selection of Size for Separation. It is quite possible and accurate to run a gradation using any convenient sizes for the separation, without reference to the specifications. After the test is plotted on a curve, then the gradation limits may be plotted. Overlapping gradations with this method are no problem. It is usually more convenient, however, to select points from the gradation limits, such as the minimum 50% size, the minimum 15% size, and one or two others as separation points.

**E X A M P L E   G R A D A T I O N - S P E C I F I C A T I O N S**

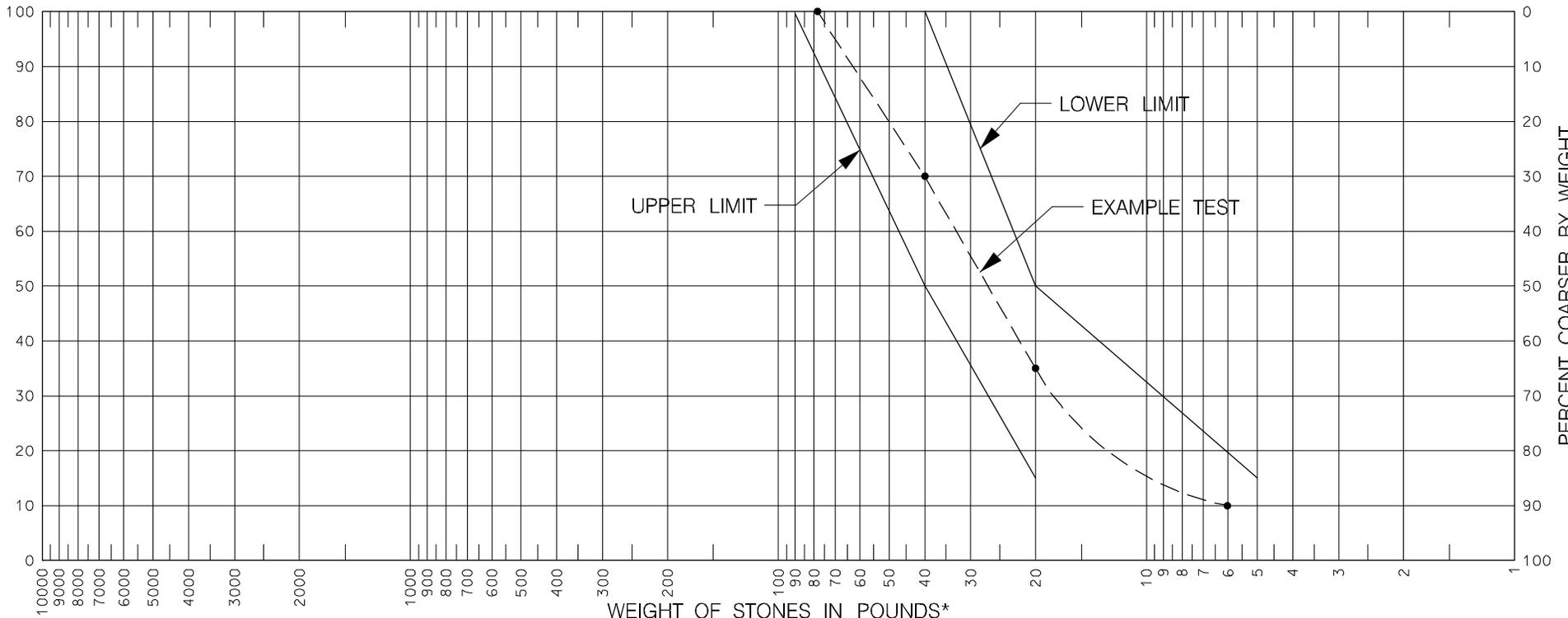
Stone Weight in Lbs.	Percent Finer by Weight
90 - 40	100
40 - 20	50
20 - 5	15

**E X A M P L E   G R A D A T I O N - W O R K S H E E T**

Stone Size (lbs)	Weight Retained	Individual % Retained	Cumulative		Specification % Finer by wt
			% Ret.	% Pass	
90	0	0	-	100	
40	9600	30	30	70	100
20	11200	35	65	35	50
5	8000	25	90	10	15
< 5	3200	10	100	-	
Total Weight	32000lbs				

Remarks: LARGEST STONE SIZE = 78 LBS

PERCENT FINER BY WEIGHT



PERCENT COARSER BY WEIGHT

WEIGHT OF STONES IN POUNDS\*  
 SPECIFIC GRAVITY OF ROCK \_\_\_\_\_  
 \*ASSUMING STONE SHAPE MIDWAY BETWEEN A SPHERE AND CUBE

SPECIFIC GRAVITY

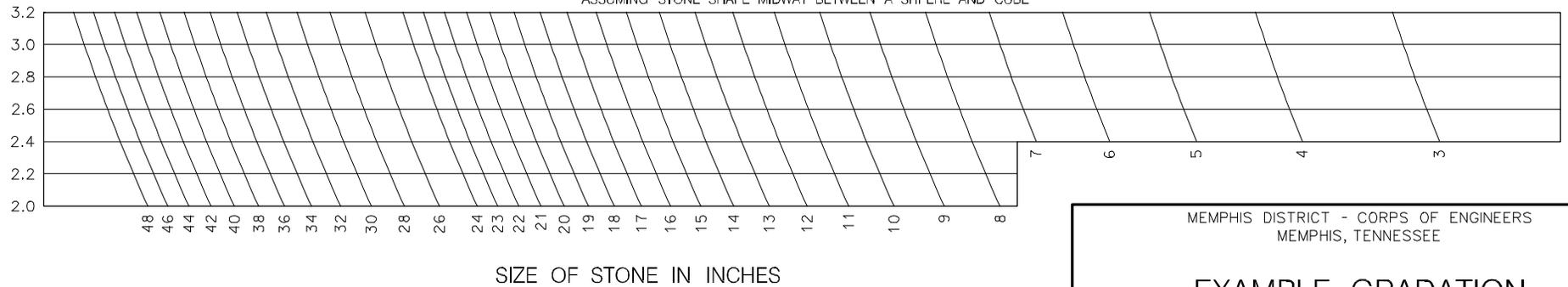


PLATE IV

MEMPHIS DISTRICT - CORPS OF ENGINEERS  
 MEMPHIS, TENNESSEE

## EXAMPLE GRADATION

PROJECT: \_\_\_\_\_ DATE: \_\_\_\_\_

### RIPRAP GRADATION CURVES

**G R A D A T I O N   T E S T   D A T A   S H E E T**

Quarry \_\_\_\_\_ Stone Tested \_\_\_\_\_

Date of Test \_\_\_\_\_ Testing Rate \_\_\_\_\_

**T E S T   R E P R E S E N T S**

Contract No.	District	Tons
TOTAL		

**G R A D A T I O N**

Stone Size (lbs)	Weight Retained	Individual % Retained	Cumulative % Ret.	Cumulative % Pass	Specification % Finer by wt
Total Weight					

Remarks: \_\_\_\_\_

I Certify that the above stone sample is representative of the total tonnage covered by this test report.

Contractor Representative \_\_\_\_\_

Government Representative \_\_\_\_\_

-- End of Section --

DIVISION 2 - SITE WORK

SECTION 02544

6" COMPACTED CLAY GRAVEL

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	1.2.2 Material
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1.3	APPLICABLE PUBLICATION
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	2.1.3 Gradation
2.2	SAMPLING AND TESTING
	2.2.1 General
	2.2.2 Contractor Testing
PART 3	EXECUTION
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3.2	PLACEMENT

DIVISION 2 - SITE WORK

SECTION 02544

6" COMPACTED CLAY GRAVEL

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, and materials, and performing all operations necessary for constructing 6" compacted clay gravel, all as indicated on the drawings and/or specified herein.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements, and maintain records of his quality control for all construction operations including but not limited to the following:

1.2.1 Subgrade

Location, preparation.

1.2.2 Material

Material delivered to the site conforms to specifications and is comparable to samples of material previously tested and approved for use. Tests include gradation, liquid limit and plasticity index of material passing the No. 40 sieve.

1.2.3 Placement

Width, thickness, distribution, compaction, final grading, and maintenance.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATION

The following publication of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 698-91	Laboratory compaction Characteristics of Soil Using <sub>3</sub> Standard Effort (12,400 ft-lbf/ft <sup>3</sup> (600 kN-m/m <sup>3</sup> ))
D 1556-90 (R 1996)	Density and Unit Weight of Soil In-Place by the Sand-Cone Method

D 2216-92	Water (Moisture) Content of Soil and Rock
D 2922-91	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 3017-88 (1993)	Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
D 4318-95a	Liquid Limit, Plastic Limit, and Plasticity Index of Soils

PART 2 PRODUCTS

2.1 AGGREGATE

Aggregate for 6" compacted clay gravel shall be composed of sand-clay-gravel mixtures; gravel or stone screenings; crusher run coarse aggregate consisting of gravel or crushed stone with sand and binding material; or any combination of such materials which conforms to specified requirements. All material shall be free from organic matter and lumps or balls of clay. The material shall conform to the requirements as specified in paragraphs 2.1.1 and 2.1.2, and shall conform to the gradation specified in paragraph 2.1.3. All aggregate furnished under this contract shall comply favorably with representative samples as to quality, gradation, and moisture content.

2.1.1 Coarse Aggregate

Coarse aggregate is defined as aggregate retained on the No. 10 (2.00 mm) sieve. Coarse aggregate shall consist of hard, durable particles or fragments of stone or gravel. Materials that are soft, pliable, or subject to rapid deterioration when exposed to weathering shall not be used.

2.1.2 Fine Aggregate

Fine aggregate is defined as aggregate passing the No. 10 (2.00 mm) sieve. Fine aggregate shall consist of natural or crushed sand, and also shall include fine mineral particles passing the No. 200 (0.075 mm) sieve. The fraction of the material passing the No. 200 (0.075 mm) sieve shall be no more than two-thirds that of the fraction passing the No. 40 (0.425 mm) sieve. That portion of the aggregate passing the No. 40 (0.425 mm) sieve shall have a liquid limit of not more than 35 and a plasticity index of not less than 6, nor more than 15, as determined by ASTM D 4318. However, if crushed stone is utilized then the plasticity index shall be between 0 and 15.

2.1.3 Gradation

Aggregate material for 6" compacted clay gravel shall conform to the following gradation:

<u>U.S. Standard Sieve</u>	<u>Permissible Limits Percent by Weight, Passing</u>
3"	100
1-1/2"	95-100
3/4"	65-100
3/8"	40- 80
No. 4	30- 60
No. 10	20- 50
No. 40	15- 35
No. 200	5- 15

2.2 SAMPLING AND TESTING

### 2.2.1 General

Representative samples for testing of the material shall be taken by the Contractor under the supervision of the Contracting Officer. All costs of sampling and testing, except as specified in 3.2 below, shall be borne by the Contractor and no separate payment will be made therefor.

### 2.2.2 Contractor Testing

Prior to delivery of any material to the job site, the material shall be tested for compliance with the specifications by an approved independent testing laboratory. In the event a noticeable change in the materials is observed during placement, such testing shall be performed at the direction of the Contracting Officer regardless of the quantity of material delivered. Certified results of the tests shall be submitted to the Contracting Officer for approval.

## PART 3 EXECUTION

### 3.1 SUBGRADE

The subgrade shall be a 16" compacted clay layer upon which the 6" compacted clay gravel is to be placed. The subgrade shall be compacted as specified in SECTION 02222, paragraph 3.1.4.2. Subgrade for all surfacing shall be graded and smoothed prior to placing the surfacing. Subgrade for the 6" compacted clay gravel shall be in a satisfactory condition for receiving aggregate material, as applicable. Aggregate shall not be placed on frozen ground.

### 3.2 PLACEMENT

Aggregate material shall be placed on the prepared 16" compacted clay layer. Material placed shall be spread uniformly to such depths and lines that when compacted will have the applicable thickness, width, and cross section indicated therefor on the drawings. The 6" compacted clay gravel course shall be compacted to a density of at least 95 percent of the laboratory density obtained by the standard density test (ASTM D 698). The field density determination shall be by the Sand-Cone Method (ASTM D 1556) or the Nuclear Method (ASTM D 2922), Method B. The moisture content after compaction shall be within the limit of 2 percentage points above the optimum and 3 percentage points below optimum moisture contents determined by the Contractor in accordance with ASTM D 698. The aggregate materials may require moistening or aeration as necessary to provide the above specified moisture content. The field moisture content after compaction shall be performed in accordance with ASTM D 2216 or ASTM D 3017. To assure that proper compaction is being achieved, the Contractor shall perform a minimum of one field density and moisture content test per 200 cubic yards of material placed. The Contracting Officer can request field density and moisture content tests at any time that compaction appears inadequate. Tests shall be performed by an approved commercial testing laboratory or may be tested by facilities furnished by the Contractors. Should the Contracting Officer ask for additional tests these tests will be at Government expense.

--End of Section--

DIVISION 2 - SITE WORK

SECTION 02546

AGGREGATE SURFACING

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2.2.2	Contractor Testing
PART 3	EXECUTION
3.1	SUBGRADE COMPACTION
3.2	SUBGRADE
3.3	PLACEMENT

DIVISION 2 - SITE WORK

SECTION 02546

AGGREGATE SURFACING

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, and materials, and performing all operations necessary for constructing aggregate surfacing upon the crown of the existing gravel road, gravel levee road, and gravel ramp all as indicated on the drawings, as directed by the Contracting Officer, and/or as specified herein.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements, and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Subgrade

Location, preparation.

(2) Materials

Material delivered to the site conforms to specifications and is comparable to samples of material previously tested and approved for use. Tests include gradation, liquid limit and plasticity index of material passing the No. 40 sieve.

(3) Placement

Width, thickness, distribution, compaction, final grading, and maintenance.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATION

The following publication of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

D 698-91	Laboratory compaction Characteristics Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> (600 kN-m/m <sup>3</sup> ))
D 1556-90 (R 1996)	Density and Unit Weight of Soil in Place by the Sand-Cone Method
D 2216-92	Water (Moisture) Content of Soil, Rock and Ed Comt 1
D 2922-91	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 3017-88 (R 1993)	Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
D 4318-95a	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

## PART 2 PRODUCTS

### 2.1 AGGREGATE

Aggregate for surfacing shall be composed of sand-clay-gravel mixtures; gravel or stone screenings; crusher run coarse aggregate consisting of gravel or crushed stone with sand and binding material; or any combination of such materials which conforms to specified requirements. All material shall be free from organic matter and lumps or balls of clay. The material shall conform to the requirements as specified in 2.1.1 and 2.1.2 below, and shall conform to the gradation specified in 2.1.3 below. All aggregate surfacing furnished under this contract shall comply favorably with representative samples as to quality, gradation, and moisture content.

#### 2.1.1 Coarse Aggregate

Coarse aggregate is defined as aggregate retained on the No. 10 (2.00 mm) sieve. Coarse aggregate shall consist of hard, durable particles or fragments of stone or gravel. Materials that are soft, pliable, or subject to rapid deterioration when exposed to weathering shall not be used.

#### 2.1.2 Fine Aggregate

Fine aggregate is defined as aggregate passing the No. 10 (2.00 mm) sieve. Fine aggregate shall consist of natural or crushed sand, and also shall include fine mineral particles passing the No. 200 (0.075 mm) sieve. The fraction of the material passing the No. 200 (0.075 mm) sieve shall be no more than two-thirds that of the fraction passing the No. 40 (0.425 mm) sieve. That portion of the aggregate passing the No. 40 (0.425 mm) sieve shall have a liquid limit of not more than 35 and a plasticity index of not less than 6, nor more than 15, as determined by ASTM D 4318. However, if crushed stone is utilized then the plasticity index shall be between 0 and 15.

#### 2.1.3 Gradation

Aggregate surfacing material shall conform to the following gradation:

<u>U.S. Standard Sieve</u>	<u>Permissible Limits Percent by Weight, Passing</u>
3"	100
1-1/2"	95-100
3/4"	65-100
3/8"	40- 80
No. 4	30- 60
No. 10	20- 50
No. 40	15- 35
No. 200	5- 15

## 2.2 SAMPLING AND TESTING

### 2.2.1 General

Representative samples for testing of the material shall be taken by the Contractor under the supervision of the Contracting Officer. All costs of sampling and testing, except as specified in 3.3 below, shall be borne by the Contractor and no separate payment will be made therefor.

### 2.2.2 Contractor Testing

Prior to delivery of any material to the job site, the material shall be tested for compliance with the specifications by an approved independent testing laboratory. In the event a noticeable change in the materials is observed during placement, such testing shall be performed at the direction of the Contracting Officer regardless of the quantity of material delivered. Certified results of the tests shall be submitted to the Contracting Officer for approval.

## PART 3 EXECUTION

### 3.1 SUBGRADE COMPACTION

The top 16-inches of subgrade shall be compacted as specified in SECTION 02544 paragraph 3.1.

### 3.2 SUBGRADE

The subgrade shall be symmetrical about the centerline of the existing gravel road, the existing gravel levee road, and the existing gravel ramp upon which aggregate surfacing is to be placed. Subgrade for all surfacing shall be graded and smoothed prior to placing the surfacing. Subgrade for the surfacing shall be in a satisfactory condition for receiving aggregate surfacing for a distance of at least 200 feet in advance of the placing of aggregate surfacing material,

as applicable. Aggregate shall not be placed on frozen ground.

### 3.3 PLACEMENT

Aggregate surfacing material shall be placed on the prepared subgrade of the above mentioned roadways and ramps as applicable to the limits of work as indicated on the drawings or as directed by the Contracting Officer. Material placed shall be spread uniformly to such depths and lines that when compacted will have the applicable thickness, width, and cross section as directed by the Contracting Officer. The aggregate surfacing materials shall be compacted to a density of at least 95 percent of the laboratory density obtained by the standard density test (ASTM D 698). The field density determination shall be by the Sand-Cone Method (ASTM D 1556) or the Nuclear Method (ASTM D 2922), Method B. The moisture content after compaction shall be within the limit of 2 percentage points above the optimum and 3 percentage points below optimum moisture contents determined by the Contractor in accordance with ASTM D 698. The materials may require moistening or aeration as necessary to provide the above specified moisture content. The field moisture content after compaction shall be performed in accordance with ASTM D 2216 or ASTM D 3017. To assure that proper compaction is being achieved, the Contractor shall perform a minimum of six field density and moisture content tests per each graveled area specified in first sentence of paragraph 3.2. The Contracting Officer can request field density and moisture content tests at any time that compaction appears inadequate. Tests shall be performed by a commercial testing laboratory or by facilities and personnel furnished by the Contractor, all as approved by the Contracting Officer.

--End of Section--

DIVISION 2 - SITE WORK

SECTION 02708

RELIEF WELLS

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    - 3.1.14.2.3 Flow Meter
    - 3.1.14.2.4 Sand Infiltration Measurement
  - 3.1.14.3 Data
  - 3.1.14.4 Procedure
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- 3.3 CONCRETE

DIVISION 2 - SITE WORK

SECTION 02708

RELIEF WELLS

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all plant, labor, material and equipment, and performing all operations required for proper execution of the relief well work as specified herein and/or indicated on the drawings. Such work includes installation of new relief wells; relief well outlets; pump testing new wells; and all work incidental thereto.

1.2 QUALITY CONTROL

(1) General

The Contractor shall perform the inspection, sampling and testing, corrective actions, and reports required to substantiate his compliance with the technical provisions of this specification. Responsibility for quality control of relief well construction, rehabilitation, sampling and testing procedures shall be the Contractor's. The Contractor's quality control organization shall have personnel sufficient in number to monitor at all times the relief well activities.

(2) Inspection

The Contractor's quality control organization shall be responsible to observe and control for compliance to technical specifications all relief well operations including but not limited to the following: survey layout, materials, drilling method, joints, bottom plug, materials storage, well pipe assembly and installation, backfilling, cleaning, development, pumps, pump testing, installation of outlets, chemical treatment, environmental compliance and safety. Completed relief wells shall be protected against damage and contamination. The detailed inspection may be assigned to the construction foreman supervising the work.

(3) Sampling and Testing

The Contractor's quality control organization shall verify that the well pipe material and manufacturing conforms to the specifications before delivery to the project. The particle size distribution of the gravel pack shall be sampled and tested by the Contractor using the U. S. Standard Sieves described in paragraph 3.1.7. Within 48 hours before being placed in the relief well to be backfilled, the gravel pack shall be sampled from the material stockpiled at the project.

There shall be at least one gravel pack particle size distribution test for each well. The laboratory test procedure shall conform to that presented in EM 1110-2-1906, Appendix V, a copy of which will be furnished the Contractor upon request. A pumping and sand infiltration test and alignment and plumbness tests shall be performed in accordance with technical provisions herein specified.

(4) Action Required

When quality control monitoring or testing detects non-conformance with specifications, corrective action shall be directed. The details of the irregularities and the actions directed to correct them shall be reported immediately to the representative of the Contracting Officer and included in the daily Quality Control report. Corrective action shall include steps taken to assure against recurrence of the irregularity.

(5) Reports

Reports shall include, for each new relief well, WES Form 797 "Relief Well Installation Report," WES Form 796, "Relief Well Pumping Test Report" and ENG Form 2087, "Gradation Curves" for gravel pack. Reports for rehabilitated wells shall include the previously referenced WES form 796 and WES form 797 as applicable. A copy of each report form is attached at the end of this section. The elevation of changes between materials on these reports shall be to the nearest 0.1 foot. The report on backfill material shall include a gravel pack gradation curve. Data concerning installation and development of the relief well shall be included in the report on relief well installation. The pump test report shall include the time pumped and rate of flow, the draw down response data of the pumped well, and the amount of sand produced by the well during pumping. The reports shall be completely filled out and shall be submitted to the Contracting Officer as part of the daily quality control report specified in the Special Contract Requirements.

A copy of these records and tests as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to elsewhere in this section by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 53-96	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
A 276-96	Stainless Steel Bars and Shapes
A 312/A312M-95a	Seamless and Welded Austenitic Stainless Steel Pipes

A 555/A555M-94a            General Requirements for Stainless Steel Wire and  
Wire Rods

C 117-95                    Material Finer than 75-um (No. 200) Sieve in  
Mineral Aggregates by Washing

D1586-84                    Penetration Test and Split-Barrel Sampling of Soils

THE ALUMINUM ASSOCIATION (AA) SPECIFICATIONS

Specifications for Aluminum Structures Available from: Aluminum  
Association, Inc., 818 Connecticut Avenue, NW Washington, D.C. 20006

FEDERAL SPECIFICATIONS (FED. SPEC.)

TT-E-489H                    Enamel, Alkyd, Gloss Low VOC content

STEEL STRUCTURES PAINTING COUNCIL SPECIFICATIONS (SSPC)

SSPC-Paint 25                Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and  
Alkyd Primer

DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS, ENGINEER MANUAL

EM 1110-2-1906                Laboratory Soils Testing, 1 May 1980

PART 2            PRODUCTS (Not Applicable)

PART 3            EXECUTION

3.1    GENERAL - NEW RELIEF WELLS

3.1.1    Shop Drawings and Field Procedures

The Contractor shall submit shop drawings which present details of his methods for drilling, coupling well screen and riser sections together, installing the well screen and riser, backfilling, developing and pump testing the well. The shop drawings shall show the well screen material, size, perforation size, shape and pattern and bottom plug material and installation detail. Also, the riser pipe and well discharge details shall be shown on the shop drawings. Any Contractor proposed substitutes or alternates in material, construction details, or methods must be presented in the shop drawings. No phase of the work shall be initiated until all shop drawings concerning that activity, have been approved.

### 3.1.2 Location

The exact location of each well will be determined in the field by the Contracting Officer. The total number of wells, approximate locations, and spacings are shown on the drawings.

### 3.1.3 Depth-of-Well

The length of well screen, and length of riser pipe shall conform to the elevations shown on the drawings.

### 3.1.4 Obstructions Encountered

If obstructions are encountered in the foundation which, in the opinion of the Contracting Officer, render it impracticable to complete the well to the directed depth, the Contracting Officer may adjust the depth to conform to that of the obstruction. Alternatively, the Contracting Officer may direct the Contractor to abandon the well, plug the hole by backfilling in accordance with paragraph 3.2 and construct another well at an adjacent site. The Contractor shall be required to provide and use drills and equipment that are capable of drilling through insitu wood deposits within the alluvium and capable of removing cobbles up to 5-1/2 inches in diameter. The presence of cobbles up to 5-1/2 inches in diameter or insitu wood which may be encountered during drilling, shall not be considered as obstructions or sufficient reason for abandonment of a well. Where obstructions are encountered, drilling shall be continued until it is demonstrated to the Contracting Officer that further efforts to advance the drill hole are impracticable. Such demonstration shall include, but not be limited to, continuing drilling operations when no gain in depth is being made for a minimum of 15 minutes. Wells which are abandoned because of impracticability of completion to the desired depth will be paid for as specified in paragraph 1.2.2(4) SECTION 01025, except that payment will not be made if abandoned because of faulty operation or neglect of the Contractor.

### 3.1.5 Well Screen

#### 3.1.5.1 General

Well screen shall be stainless steel and shall be of the dimensions hereinafter specified. The inside diameter of the screen shall be not less than 10 inches. Screen openings shall be uniform in size and pattern, and shall be spaced approximately equally around the circumference of the pipe. Before installation all well screen shall be approved by the Contracting Officer.

#### 3.1.5.2 Stainless Steel

##### 3.1.5.2.1 General

Stainless steel well screen shall be a non clogging wire-wrapped continuous slot strainer equivalent to that manufactured by Johnson Division, UOP, Inc., St. Paul, MN. All pipes, rods, bars, and wire shall be stainless steel conforming to ASTM A 276, A 312 or A 555 for Grade TP-304 as applicable. The width of the

clear space between the wire wrappings shall be 0.10 inch and shall provide a total opening of not less than 188 square inches per foot of 10 inch diameter screen. The screen shall have a minimum clear inside diameter of 10 inches.

#### 3.1.5.2.2 Coupling

Couplings for stainless steel well screen shall consist of the same material as the well screen and shall be welded joint couplings. Connections between the well screen and the riser pipe shall be threaded connections or welded joint couplings. If welded connections are used, end fittings for stainless steel well screens shall be suitably beveled and furnished with welding rings of the same alloy as the well screen and riser pipe. Welding rings which join well screen to riser pipe shall adequately provide for the transition from well screen to riser pipe. Joints in riser pipe shall be single or double bevel welded and shall have strengths equal to the pipe being joined. Deposited weld metal shall have a resistance to corrosion equal to or greater than that of the pipe used. Joints shall be designed and constructed to support the weight of the screen and/or pipe as it is lowered into the hole. Welding shall be performed by a certified welder using approved welding rods, and performed in a manner which will not cause the screen sections to deviate from a straight alignment.

#### 3.1.5.3 Bottom Plug for Well Screen

The bottom plug for each well screen shall be made of the same material and at least the same minimum thickness as the screen. Plugs shall be the same diameter as the outside of the screen and fastened to the bottom of the screen in an approved manner.

#### 3.1.6 Riser Pipe

The relief well riser pipe material and method of manufacture shall conform to the requirements specified in paragraph 3.1.5.2 above and shall be schedule 10 wall thickness. The relief well riser pipe shall have a minimum inside diameter of 10 inches. Discharge details shall be as shown on the drawings. Couplings to the well screen and between riser pipe sections shall be as specified for well screen pipes.

#### 3.1.7 Gravel Packing

Material for the gravel pack around the riser pipes and screens shall be a washed gravel composed of hard, tough, durable particles free from adherent coating. Limestone, dolomite, or carbonate materials will not be acceptable materials. The gravel pack material shall contain no detrimental quantities of vegetable matter nor soft, friable, thin, or elongated particles. The gravel pack shall meet the following gradation requirements:

<u>U. S. Standard</u> <u>Sieve No.</u>	<u>Percent by Weight</u> <u>Passing</u>
1/2 inch	100

3/8 inch	85 - 100
No. 4	50 - 70
No. 8	13- 30
No. 16	0 - 2

Materials shall be uniformly graded between the limits specified above. All points on individual grading curves obtained from representative samples of gravel pack material shall lie between the boundary limits as defined by smooth curves drawn through the tabulated grading limits plotted on a mechanical analysis diagram. The individual grading curves within these limits shall not exhibit abrupt changes in slope denoting skip grading, scalping of certain sizes or other irregularities which would be detrimental to the proper functioning of the gravel pack. For each relief well the gravel pack material and its gradation shall be approved before it is placed.

### 3.1.8 Outlet for Relief Well

#### 3.1.8.1 Installation

Each relief well will consist of a stainless steel riser that extends into a concrete slab at the specified elevation and dimensions as shown on the plans. The riser pipe shall be cut flush with the top of the concrete slab and covered with a stainless steel plate as described below in 3.1.8.2. Each well shall be installed (vertically) and fully developed according to these plans and specifications meeting all requirements before installation of the stainless steel outlet assembly will be allowed. After completion of each relief well, the outlet pipe will then be installed to the alignment and configuration as shown on the plans. The outlet pipe shall consist of 10-inch diameter stainless steel pipe with a check valve installed two feet from the end of the discharge line. A braced trench excavation shall be used to expose the riser pipe along side each well to allow attachment of the outlet pipe to the riser pipe. The trench excavation must be done in the dry with the water table at or below elevation 302 and the inlet channel dry. The trench excavation width shall also be kept at a minimum width required to install the outlet pipe or between three feet and a maximum allowable excavation width of six feet. All requirements including federal, state and local guidelines/laws for a safe excavation shall be adhered to during installation of the outlet pipe. The excavation shall extend one foot below the pipe placement elevation of 306 and backfilled to grade with a compacted pervious material as specified in SECTION 02222 paragraph 3.1.2.1 and compacted as specified in paragraph 3.1.4.1. After excavation and sand backfill placement, the unearthened riser pipe shall be cleaned and prepped for the connection of the outlet pipe assembly. A factory designed and fabricated stainless steel 10-inch diameter nipple six inches in length shall be used for the connection. However, approval from the contracting officer that the nipple fits continuously along the riser pipe will be required before the nipple is welded on to the riser pipe. All requirements specified in paragraph 3.1.5.2.2 for strength and corrosion resistance shall be met in the welded connections along the outlet pipe. The riser pipe area inside the nipple shall then be torch cut and removed to provide a minimum opening of 85 percent of the cross sectional area of a 10-inch diameter pipe. The remaining outlet pipe sections shall then be welded to the dimensions and alignment as shown on the plans. A flange

meeting ANSI 150# flange pattern shall be welded on the end of the stainless steel outlet pipe for connection of the flanged-end-in-line check valve and end two foot section of stainless steel outlet pipe. The check valve shall meet the requirements as specified in 3.1.8.3 below. After the outlet pipe and check valve are completely installed, the area around the pipe to one foot above the top of the pipe shall be backfilled with compacted pervious material. Impervious semi-compacted material shall be used to complete the inlet slope sections as shown on the drawings. Semi-compaction in the trench shall be done with 2 passes of a hand tamper in 6-inch lifts. Care shall be taken by the contractor to ensure that damage to the riser pipe connection or other welded joints along the outlet pipe does not occur during backfill operations.

#### 3.1.8.2 Cover Plate

The cover plate shall be fabricated of stainless steel conforming to ASTM A 276, Grade TP 304. The plate shall be 1/2-inch in thickness and shall be square with dimensions of 15 inches per side. The cover plate shall be attached to the concrete slab using 1/2 inch by 1 1/4 inch stainless steel cap screws. The screws will thread into 1/2 inch self drilling concrete anchors placed at the locations shown on the concrete slab. The plate shall fit flush with the top of the slab and top of the 10-inch riser pipe. The plates shall be painted on all sides with a semi-gloss black enamel paint along with the exposed cap screws.

#### 3.1.8.3 Flanged-End In-Line Check Valve

The check valve shall be a two piece split configuration with a cast iron housing. The two halves shall be sealed by rubber sheet gaskets, cut to match the profile of the body halves. The flanges shall be drilled to match ANSI 150# flange pattern. The valve body shall be drilled and tapped for a supplied clean out plug on the top of the body and flushing connections on the bottom of the body supplied with plugs. The check sleeve inside the body is to be of the fabricated "duckbill" type. The sleeve shall be one piece rubber construction with fabric reinforcement. The inlet port shall have an integral flange, drilled to be retained by the flange bolts and acting as the gasket between the pipe and valve. The "duckbill" check shall allow passage of flow in one direction while preventing any reverse flow. The check valve shall be capable of withstanding a back pressure of 20 feet and shall have a pressure drop of no greater than 6" when passing 1500 gpm of water. The manufacturer shall submit flow test data from an accredited hydraulics laboratory to conform pressure drop data. The cast iron valve body shall be coated inside and out with coal tar epoxy. Company name and location shall be cast onto the valve body.

#### 3.1.9 Drilling

##### 3.1.9.1 General

Wells shall be drilled by the reverse rotary method, or other method approved by the Contracting Officer, in such a manner to insure proper placement of the well screen, riser pipe and gravel pack. Methods which involve radical displacement

of the formation, or which may reduce the yield of the well, will not be permitted. The use of a bentonitic type drilling fluid is prohibited. Drilling fluid additives similar and equal to "Revert" and "Fastbreak" products of Johnson Division, UOP, Inc., St. Paul, MN 55104, may be used. Drilling and installation of well screen and gravel pack shall be completed for each well without interruption. Excavated material shall be disposed of as directed by the Contracting Officer. Before drilling operation begins on each well, the Contractor shall demonstrate that all material, equipment, and experienced personnel are mobilized and that all equipment necessary for the job is adequate for an efficient operation and is operating in a satisfactory manner. Loss of a hole or well because of lack of material, inadequate or faulty equipment, or careless operating procedures will be considered cause for an abandoned well due to fault or negligence of the Contractor.

#### 3.1.9.2 Reverse Rotary Method

The diameter of the hole shall be such as shall permit the placement of the minimum thickness of gravel pack as specified in paragraph 3.1.11. The drilling fluid (not a bentonite or other expansive clay system) shall be a suspension of fine grained soil or shall be a commercial product of a recognized manufacturer, and shall have the characteristic of being readily removable from the gravel pack and the walls of the formation by development methods as specified in paragraph 3.1.12. If the walls of the hole above the top of the gravel pack require support during development operations, a temporary casing similar to that specified in paragraph 3.1.9.3 shall be placed so as to extend from the ground surface to at least three feet below the top of the gravel pack material.

#### 3.1.9.3 Temporary Casing

A temporary well casing of either iron or steel, new or used, may be used to support the sides of the entire hole during drilling and placement of screen, riser pipe, and gravel pack and to support the sides of the unbackfilled portion of the hole during development of the well. Any temporary casing shall have an inside diameter large enough to provide the minimum gravel pack thickness, as specified in paragraph 3.1.11, entirely around the well screen or riser pipe and shall have sufficient thickness to retain its shape and maintain a true section throughout its depth, and may be in sections of any convenient length. The temporary casing shall be securely anchored to the drill rig or ground surface at all times until removed. The temporary casing shall be such as to permit its removal without interfering with the gravel pack or riser pipe. Methods of installation which will create a cavity outside the temporary casing will not be permitted.

#### 3.1.10 Installation of Riser Pipe and Screen

##### 3.1.10.1 Assembly

All riser pipe and screen shall be new and in good condition before installation and all couplings and other accessory parts shall be securely fastened in place. The successive lengths of pipe shall be arranged to provide accurate placement of the screen sections in the soil strata. The use of lengths of screen and

riser shorter than 15-ft. long will not be permitted unless previously approved by the Contracting Officer. The bottom of the screen and riser assembly shall be equipped with an appropriate centering guide which will satisfactorily center the assembly in the hole and hold it securely in position while the gravel pack material is being placed. Centering guides may be placed at other locations along the screen and riser pipe assembly provided they do not interfere with placement of gravel pack material as specified in paragraph 3.1.11.

#### 3.1.10.2 Joints

Sections of relief well pipe shall be jointed together as specified in paragraph 3.1.5.2.2. Joints shall be designed to provide a strength capable of supporting the weight of the relief well stem as it is lowered into the hole.

#### 3.1.10.3 Installation

The assembled riser pipe and screen shall be placed in the hole in such manner as to avoid jarring impacts and to insure that the assembly is centered and not damaged or disconnected. After the screen and riser pipe have been placed, a gravel pack shall be constructed around the screen section as specified in paragraph 3.1.11 and the well developed as specified in paragraph 3.1.12. The top of the riser pipe shall be held at the designated elevation during placement of the gravel pack. Immediately after the installation of the well screen and riser pipe assembly, the depth of the well shall be measured by means of an approved sounding device.

#### 3.1.10.4 Plumbness and Alignment

Each well shall be installed and maintained straight and plumb during placement of gravel pack and development. Immediately before placing the gravel pack and with the top of the well fastened securely in a vertical and horizontal position, an alignment test shall be conducted in the presence of the Contracting Officer. Excessive misalignment or deviation from plumb shall be corrected before placing the gravel pack. The alignment test shall consist of two 10-ft. sections of standard 6-in. pipe coupled together with a 7.39-in. OD coupling lowered inside the well for the full depth of the well and withdrawn without binding against the sides of the well screen or riser pipe. The Contractor shall furnish the above apparatus and shall perform the alignment tests. The Contractor shall notify the Contracting Officer a minimum of 8 working hours prior to performing the alignment tests. After completion of the alignment test, the Contracting Officer may elect to perform a plumbness test before placement of the gravel pack. This test, if performed, will be at the expense of the Government using Contractor-furnished equipment and shall consist of a plumb-line run from the top of the well to the bottom of the well. A variation of 12-in. per 100-ft, will be permitted in the combined length of screen and riser pipe of the well. In the event the Contracting Officer elects to perform the plumbness survey prior to gravel pack placement and the well fails to conform to the standard described above, the plumbness of the well shall be corrected by the Contractor at no additional expense to the Government. The Contractor shall provide assistance to the Contracting Officer in performing the plumbness test, if requested.

### 3.1.11 Placing Gravel Pack

After the screen and riser pipe have been placed, and alignment surveys and plumbness surveys (if performed) are conducted, the gravel pack shall be placed through two 4-in. I.D. tremies with no obstructions. The tremie hopper shall be so constructed and balanced that gravel pack material will feed freely and equally to two (2) tremie pipes located at 180 degrees on each side of the screen. Connections between the tremie pipe and the hopper shall be designed for quick connection or disconnection for adding or removing tremie pipe with least possible delay. Tremie pipe shall consist of equal 10-ft lengths of standard 4-in. pipe with 1/16-in. wide equally spaced slotted openings. Tremie pipe shall contain no dents, flat spots, damaged threads, or holes, and shall be reamed and/or deburred to full I.D. of the pipe. The tremie guide shall consist of a metal ring or rings of sufficient diameter to slip freely over riser pipe and screen with 4-in. collars welded to the guide at 180 degrees to securely hold the tremie pipe in place. The Contractor shall be equipped to quickly and efficiently add gravel pack material to the hopper in any position from the ground surface to the maximum height of the hopper. No material shall be allowed to enter the well except through the tremie pipes. At no time shall tremie guide or pipes be raised, lowered or supported by only one pipe. Ten feet of tremie pipe shall be installed below the lower tremie guide. The gravel pack material shall be placed in an approved manner and without significant segregation. The gravel pack shall have a minimum thickness of 6 in. between the outside of the well screen and the outside of the gravel pack and shall be placed above the top of the well screen to the level shown on the drawings. At the commencement of placing operation, the tremie shall rest on the bottom of the hole and it shall be filled with gravel pack material. The tremie shall then be raised in increments approximately equal to the increments of the gravel pack placed. At all times during the placing of the gravel pack, the tremie shall be kept filled to within five (5) ft. of its top. If temporary casing is used, the gravel pack shall be placed in increments not to exceed 2 ft; the tremie and temporary casing shall be raised in small increments approximately equal to the increments of the gravel pack placed, except that at no time prior to the completion of placement of the gravel pack shall the bottom of the casing be less than 1 ft. below the top of the gravel pack in the hole. The Contractor shall provide a means of measuring the gravel pack in the hole and also provide a means of measuring the gravel pack depth. The alternate placing of gravel pack material and withdrawing of the tremie and temporary casing shall be continued until the gravel pack has been placed to the level shown on the drawings. During the development of the well, the top of the gravel pack material shall be maintained at the level shown on the drawings. Prior to and during placement of the gravel pack, the top of the temporary casing or hole shall be covered or otherwise shielded to prevent the gravel pack from entering the space around the well except through the tremie pipe. Material which may have entered the well screen and riser pipe shall be removed before development of the well is commenced. Construction of the relief well outlets specified in paragraph 3.1.8 above or of the backfilling specified in paragraph 3.1.13 below shall not commence until the development of the well is completed and the gravel pack has been placed to the elevation shown on the drawings. The filter material may be pumped into the well using two 4-inch tremies with no obstruction as stated above provided the Contractor can pump the gravel pack without significant segregation of the gravel pack material and can

pump in a continuous manner. A plan shall be submitted to the Contracting Officer and, if approved, a well shall be installed and tested before production installation proceeds.

### 3.1.12 Development

#### 3.1.12.1 General

Following placement of gravel pack materials, the Contractor shall develop the relief well to remove all fines from the well and gravel pack so as to produce a stable well of maximum efficiency. Well development shall be by surging and air pumping or by other methods which may be approved by the Contracting Officer. At the time of development of any relief well, the well shall be free of draw down or surcharge effects due to pump testing, developing or drilling at another location. The Contractor shall be responsible for maintaining at the relief well the needed access and work area and clearance in the relief well necessary to accomplish development. The Contractor shall furnish, install or construct the necessary discharge line and troughs to conduct and dispose of the discharge a sufficient distance from the work area to prevent damage. Development shall be conducted to achieve a stable well of maximum efficiency and shall be continued until little or no additional material from the foundation can be pulled through the gravel pack. As development proceeds, gravel pack material shall be added to the annular space around the screen to maintain the top elevation of the gravel pack to the specified elevation. The Contractor shall provide a bubbler tube or other approved means for accurately determining the water level in the well under all conditions. If, at any time during the development process, it becomes apparent in the opinion of the Contracting Officer that the well may be damaged, development operations shall be immediately curtailed. The Contracting Officer may require a change in method if the method selected does not accomplish the desired results. The Contracting Officer may order that wells which continue to produce excessive amounts of fines after development be abandoned, plugged, and backfilled, and may require the Contractor to construct new wells nearby. All materials pulled into the well by the development process shall be removed prior to performing the pumping test.

#### 3.1.12.2 Surge Blocks

Surge blocks shall consist of two-groups of neoprene rubber circular disks spaced 4 feet apart and held in place by washers and spacers. Each group of disks shall consist of a one-inch thick, nine-inch diameter rubber disk, with a one-inch thick, eight-inch diameter rubber disk on either side. This combination of rubber disks shall be fixed between rigid washers 2-1/2- to 3-1/2-inches in diameter. The entire assembly shall be rigidly fastened to the end of a drill stem or pipe of sufficient mass to cause it to fall free on the downward stroke. The disks shall be replaced whenever they become worn. The Government may require the Contractor to vary the number of disks and increase the rigid washer diameter to 4-1/2-inches to result in the most effective surging action and yet be flexible enough to prevent damage to the well. The Government may also require the Contractor to make other minor changes in the design of the surge block as the work proceeds in order to accomplish a more thorough and surging action without damage to the well. The surge block shall be operated by equipment

capable of varying speeds over the full depth of the wells. The equipment shall be capable of traversing and maintaining the velocity of surge block travel along the well screen at a rate between 1-1/2 and 3 feet per second in both down and up direction. The Contractor shall submit for approval shop drawings for surge block.

### 3.1.12.3 Development

Development of wells shall not commence until drilling additives allowed by paragraph 3.1.9.1 (if used) have completely broken down and the chemical treatment specified in paragraph 3.1.12.4 has been completed. The development of wells shall consist of pumping with air to create flow from the well including removal of sediments and operating a double surge block inside the well screen in such a manner to achieve a stable well of maximum efficiency. The static water surface in the well shall not be lowered below the top of the screen during development operations. Immediately following completion of the specified chemical treatment, the Contractor shall measure the depth of the well to record to the nearest .10-foot the depth of the well. This measurement shall be compared with the actual depth of the well to determine if there is any material that has settled to the bottom during the chemical operations before beginning development. The Contractor shall perform sufficient cycles of development until little or no sand can be pulled into the well but must complete three cycles per well as a minimum. Each cycle shall consist of one phase of surging and one of air pumping. The well shall be surged at a rate of between 1.5-3.0 feet per second along the well screen and in a manner such that the surge block shall not impact the bottom of the well. Surging shall proceed for a minimum of 60 minutes per phase. The Contractor shall make continuous adjustments in the length of travel of the surge block to avoid impacting the surge block on the bottom of the well. Development shall begin above the screen and move progressively downward to prevent the surge block from becoming sand locked. The initial surging motion should be relatively gentle and begin in the riser pipe 10 to 15 feet below the static water level. After waiting 5 minutes following completion of each surging phase, the Contractor shall measure and record to the nearest .10-foot, the depth to the top of any material that has been brought into the well and settled at the bottom. Upon completion of each surging phase the well shall be air pumped at a rate of 50-100 g.p.m. for a minimum of thirty minutes to remove sediment material or as directed by the Contracting Officer. At the conclusion of the development process, the well shall be subjected to a period of intermittent pumping which shall be performed by pumping the well at a capacity sufficient to produce a rapid draw down in the well of approximately 5- to 10-ft and then stopping the pump (backflow through the pump shall not be permitted) to permit the water surface to rise to its former elevation and then repeating the procedure. Cycle time for this procedure shall vary as directed but shall not be more than 3 cycles per minute. A turbine or centrifugal type pump shall be used with any attachment(s) necessary to accomplish rapid starting and stopping for intermittent pumping. The pump intake shall be set between 2- and 6-ft from the bottom of the well. The amount of draw down or rate of pumping during the intermittent pumping may be adjusted by the Contracting Officer if in the opinion of the Contracting Officer, the efficiency of the well might be positively affected. Intermittent pumping shall be continued for one hour after which time all material remaining in the well shall be removed.

#### 3.1.12.4 Chemicals

To assist in dispersing and removing fines and drilling fluid from the walls of the drilled hole and from the gravel pack, chemicals shall be added to the well between 24 and 36 hours before development of the relief well. Following initial installation of the well screen and riser assembly, placement of the gravel pack and cleanout of the well, a glassy polyphosphate (example: trisodiumphosphate or TSP) in the amount of 5 lbs of chemical to each 100 gallons of water in the well shall be dissolved in water and poured into the well. The chemicals shall be mixed in the well by slowly injecting compressed air at the bottom of the well for a period of 2 hours or by other methods as may be approved by the Contracting Officer. No discharge from the well shall be allowed during mixing. Calcium hypochlorite (example: HTH) with a minimum of 70 percent available chlorine in the amount of one pound per 100 gallons of water in the well shall be dissolved in water, poured into the well and the mixing process repeated. The chemicals in the well shall be agitated by the method described above for two hours at 8 hour intervals with the last agitation being immediately prior to initiation of development of the relief well.

#### 3.1.13 Backfilling

After the well has been developed, the annular space above the gravel pack shall be backfilled by first placing a 12-inch minimum layer of Ottawa sand on the gravel pack and then filling the remainder of the space up to the concrete slab with a grout mix of one bag (94 lbs) of cement to 5 gallons of water with a bentonite-cement ratio of 1 part bentonite to 30 parts cement. This grout mix shall be injected at the bottom of the annular space to be grouted under a maximum pressure of 10 psi. A concrete slab with concrete conforming to the requirements as specified in paragraph 3.6 below shall be placed above the grout, as shown on the drawings. The temporary casing, if used, shall be withdrawn in increments as the grout is placed. The Contractor shall fill with impervious material to original grade all pits such as those incidental to the reverse rotary method of drilling. If excavation for the outlet pipe assembly damages the grout mix placed around the riser pipe, then compacted impervious material will be placed around the pipe from elevation 304 to the top of the well during the backfilling of the excavation trench. Impervious material will be hand compacted to seal the soil area around the riser pipe meeting the compaction requirements as specified in SECTION 02222 paragraph 3.1.4.2.

#### 3.1.14 Pumping Tests

##### 3.1.14.1 General

Upon completion of installation, surging, and development pumping, and before final acceptance, each well shall be subjected to a pumping test. The test pumping and sand infiltration tests hereinafter specified may be performed either before or after placement of the grout mix prescribed in paragraph 3.1.13, except that the concrete slab shall not be placed prior to completion of the pumping and sand infiltration tests. In no event shall the pumping tests be performed when the ground water table at the well is less than 10 feet above the top of the well

screen. Prior to commencement of the pumping test, the Contractor shall provide approved means for accurately determining the water level in the well under all conditions. The Contractor shall furnish and install a flow meter of standard design for the purpose of measuring the discharge from the well during the pumping test. The Contractor shall furnish, install, or construct the necessary pipe discharge line, troughs, or ditches necessary to dispose of the pumping test discharge a sufficient distance from the work area to prevent damage. After completion of the test, the depth of the well shall be measured, by means of an approved method, under the direction of a representative of the Contracting Officer.

#### 3.1.14.2 Equipment

##### 3.1.14.2.1 Pump

The Contractor shall provide a pump capable of producing the specified draw down over a period of time sufficient to satisfactorily perform the pumping test specified. The use of deep well pumps will be permitted provided that the pump itself is kept within the riser pipe, and the Contractor demonstrates that all specified requirements of pumping and sand measurement can be complied with. The pump shall be complete with either gasoline, diesel, or electric motor. In case an electric motor is used, the Contractor shall provide, without additional cost to the Government, the electrical power and the necessary wiring which he will remove at the completion of the pumping test.

##### 3.1.14.2.2 Water Level

The Contractor shall provide means for accurately determining the water level in the well under all conditions. This means of measurement shall be capable of determining the water level in the wells before, during, and after pumping tests. The use of a weighted tape shall not be regarded as sufficiently accurate for such measurement.

##### 3.1.14.2.3 Flow Meter

The Contractor shall furnish and install a calibrated flow meter of standard design for the purpose of measuring the discharge from the well during the pumping test. The calibration of the flow meter shall be checked at periodic intervals.

##### 3.1.14.2.4 Sand Infiltration Measurement

The Contractor shall furnish an approved large baffled tank (minimum capacity 1,000 gallons) into which the well discharge shall be pumped for the purpose of determining whether sand and/or material is being pumped out of the well or the pump discharge line shall be fitted with a Rossum centrifugal sand sampler, or an approved equal.

#### 3.1.14.3 Data

As a minimum the following test data items shall be obtained and recorded by the

Contractor on WES Form 796, a copy of which is attached at the end of this section. The last two items shall be checked by the Contracting Officer.

Time of observation.

Depth of water in well before, during, and after pumping.

Flow in gpm.

Elevation of water in well before and after pumping.

Elevation of water in adjacent wells or piezometers before and during pumping, when requested by the Contracting Officer.

The depth of sand in well before, during, and after pumping.

Amount of sand pumped out of well and collected in tanks.

#### 3.1.14.4 Procedure

The pumping and sand infiltration tests shall be conducted under the direction of the Contracting Officer. The Contractor shall test each well by pumping continuously for a minimum of two hours. The pumping shall be at a constant rate sufficient to produce either a draw down of 10 feet or a production of 650 gpm. No test pumping of a well will be permitted concurrently with drilling, surging, or pumping of any other well within 200 feet therefrom. In the event that the test is interrupted, other than by order of the Contracting Officer, prior to the completion of the specified period of continuous operations, the test shall be re-run at no additional expense to the Government. In addition to the test described above, the Contracting Officer may direct the Contractor to perform additional testing. Such additional testing shall conform in general to the requirements specified above with the exception that the duration of the tests and the approximate drawdown will be determined by the Contracting Officer. The test, to be successful, shall be continuous throughout the specified period. In the event that sand or other material infiltrates into the well as a result of the pumping test, the following procedure will be followed: If the rate of sand infiltration during the latter part of the two hour pumping test has not been reduced to one pint or less per 30,000 gallons pumped, the well shall be resurged by manipulation of the test pump for 20 minutes after which the test pumping shall be resumed and shall be continued at the constant rate specified above until the sand infiltration rate is reduced to less than one pint per 30,000 gallons, but not for more than a total of eight hours. If, at the end of eight hours of pumping, the rate of infiltration of sand is more than one pint per 30,000 gallons pumped, the well shall be abandoned, except that the Contractor, if he so elects, may continue the test pumping and perform such other approved remedial work as he considers desirable, all at his own expense. If, after such additional test pumping and other remedial measures, the sand infiltration rate of a well is reduced to not more than one pint per 30,000 gallons pumped, the well will be accepted. Abandoned wells shall be plugged in accordance with paragraph 3.4 below and a new well installed nearby. Upon completion of the pumping test, any sand or filter material in the bottom of the well shall be

removed by pumping or by other approved methods, after which the Contractor shall remove all equipment, discharge lines, etc., and shall backfill any excavated areas.

#### 3.1.14.5 Records

The Contractor shall obtain and furnish to the representative of the Contracting Officer for record purposes the elevation of the water in each well before and after the development pumping, the flow in gpm at the completion of the pumping and the time of observation. The water surface elevation shall be obtained immediately before starting the surge pump and the water surface elevations and flow shall be obtained just before stopping the pump upon completion of the development pumping. This data shall be recorded on WES Form 797, a copy of which is attached at the end of this section.

### 3.2 PLUGGING ABANDONED HOLES

New wells ordered abandoned by the Contracting Officer for any reason shall be filled with a neat cement grout as specified at the end of this paragraph. For wells ordered abandoned, the screen and riser pipe shall be salvaged from the hole, if possible. For wells ordered abandoned where the Contracting Officer determines that it is impossible or impractical to salvage the screen and riser pipe, the well shall be grouted with the screen and riser assembly in place. The riser pipe shall be removed for a minimum depth of two feet below natural ground.

Once grout has been placed, the top 2 feet below natural ground shall be backfilled with cohesive soils. The grout shall be injected through a pipe with a tip within three feet of the bottom of the well and forced upwards towards the surface. When the grout reaches the surface, it shall be allowed to flow to waste until the Contracting Officer determines that the grouting has been satisfactorily accomplished. The grout shall be injected at a maximum pressure of 1/2 psi per foot of depth of the hole. The grout mix shall consist by weight of one part Portland Cement, 4 parts sand, 2 parts Bentonite and shall be mixed with sufficient water to provide a 6" to 8" slump.

### 3.3 CONCRETE

Concrete shall consist of one part Portland cement; two parts clean, washed sand; three parts of 1-inch maximum size, clean, well-graded, hard-surfaced coarse aggregate; a suitable air-entraining admixture; and sufficient water to produce a slump between one and four inches. Entrained air shall be six percent, plus or minus 1-1/2 percent. The concrete shall be mixed in a manner so as to produce a mixture having a consistency which will permit placement as indicated on the drawings. The concrete shall have a compressive strength of 4000 psi at 28 days. Concrete mixed at the job site shall be used in the work within 45 minutes after mixing. Concrete mixed at a commercial mixing plant and transported to the job site in trucks shall be used in the work within 1-1/2 hours after mixing. Retempering of concrete will not be allowed. Concrete shall not be placed when the ambient temperature is below 40 degrees F or above 85 degrees F unless otherwise approved by the Contracting Officer in writing; nor when the concrete,

without special protection, is likely to be subjected to freezing temperatures before final set has occurred. Prior to placing concrete, all surfaces upon which the concrete is to be placed or placed against, shall be wetted. Concrete shall be thoroughly consolidated after placement by suitable vibrators or by rodding. Concrete shall be given a trowel finish and shall be cured by keeping the surface continuously wet for a period of not less than 72 hours or by application of an approved curing compound.

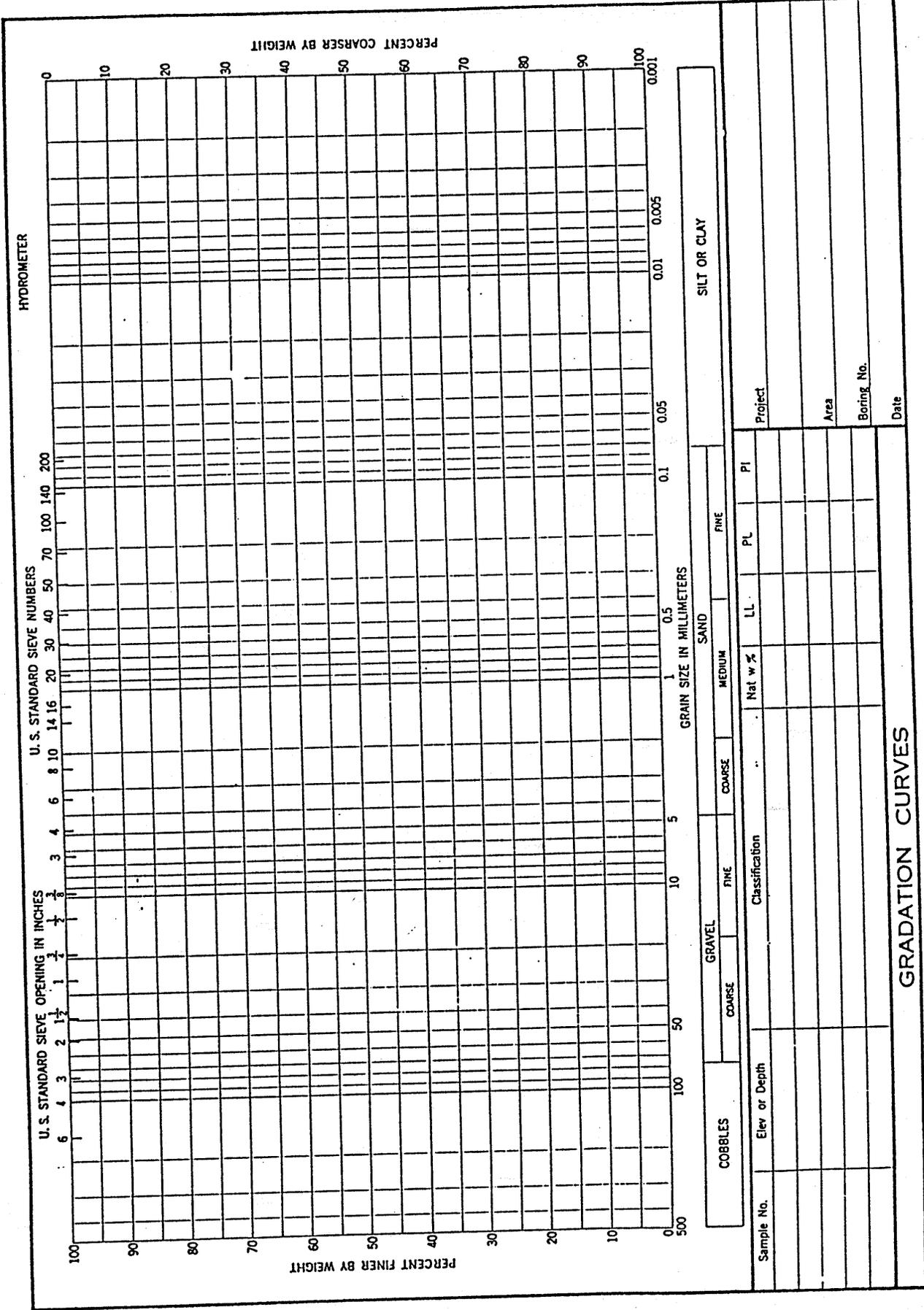
-- End of Section --



# RELIEF WELL INSTALLATION REPORT

PROJECT:				LEVEE DISTRICT:																				
LOCATION (STA):			OFFSET FROM CENTER LINE:			WELL NO.:																		
DRILLING METHOD:			DATE AND TIME: - FROM:				TO:																	
WELL SCREEN:-TYPE:		INSIDE DIAM:			PERFORATIONS:																			
RISER:-TYPE:		INSIDE DIAM:			FILTER:																			
TYPE OF WELL GUARD:		INSIDE DIAM:			TYPE OF BACKFILL:																			
CONTRACTOR:			CONTRACT NO.:			FOREMAN: OPERATOR:																		
GROUND ELEV AT WELL:		DEPTH TO: - Fine Sand:			Medium to Fine Sand:																			
ELEV TOP OF RISER:		ELEV TOP OF WELL GUARD:			ELEV TOP OF CONCRETE BACKFILL:																			
TYPE OF CHECK VALVE:		WELL EXTENSION:- Type: ;Ht:				LOG OF HOLE	DEPTH																	
FINAL WELL INSTALLATION DATA							PIPE INSTALLED																	
RISER PIPE LENGTH:		INSIDE DEPTH OF WELL:			-	0																		
"EXTRA" SCREEN LENGTH:		DEPTH OF SAND IN WELL AFTER CLEANING:						-	10															
"DESIGN" SCREEN LENGTH:		ELEV TOP OF WELL SCREEN:									-	20												
TOTAL SCREEN LENGTH:		ELEV TOP OF FILTER:												-	30									
"BLANK" PIPE LENGTH:		INSIDE BOTTOM ELEV OF WELL:															-	40						
DEPTH OF HOLE:		ELEV RISER SET AT:																		-	50			
SURGING DATA																							-	60
METHOD:		DATE AND TIME:		TOTAL SURGING TIME:			-																	
GRAVEL IN WELL BEFORE SURGING:		MATERIAL SURGED. IN:-	SURGING CYCLE	#1:	#2:	#3:		-	80															
SURGING CYCLE	#4:	#5:	#6:	#7:	#8:	TOTAL:					-	90												
SETTLEMENT OF FILTER DURING SURGING:														-	100									
PUMPING DATA																	-	-						
RATE OF PUMPING:				TOTAL PUMPING TIME:																-	-			
RATE OF SAND INFILTRATION:-START:				;End:																			-	-
REMARKS:							-																	
								-	-															
											-	-												
														-	-									
																	-	-						
																				-	-			





**GRADATION CURVES**

DIVISION 2 - SITE WORK

SECTION 02710

PIEZOMETERS

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DIVISION 2 - SITE WORK

SECTION 02710

PIEZOMETERS

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, materials and equipment, and performing all operations necessary for the installation of permanent piezometers as indicated on the contract drawings and/or specified herein. The dewatering piezometers are as specified in SECTION 02220.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work performed under this section of the specifications to assure compliance with contract requirements and shall maintain records of his quality control for all construction operations including but not limited to the following:

- (1) Materials conform to the specifications and drawings.
- (2) Installation of piezometers including locating, drilling, setting tips and backfilling.
- (3) Testing piezometers after completion of installation.
- (4) Determine the elevation of the top of the piezometer to the nearest 0.1-foot, NGVD.

The records and tests, as well as the records of any corrective action taken, shall be submitted to the Contracting Officer as part of the daily quality control report specified in SECTION 00800 paragraph 1.14 Certificates of Compliance. Also, a complete installation report showing elevation of the top of sand, bentonite pellet seal, and impervious backfill.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto:

- (1) American Society for Testing and Materials (ASTM) Publications.

A 53-90b	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
D 1785-91	Poly (Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120
D 2467-92	Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D 2564-91a	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
(2) <u>Federal Specifications (Fed. Spec.)</u>	
SS-S-200E	Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold-Applied, for Portland Cement Concrete Pavement

#### 1.4 MATERIALS

Materials shall conform to the respective publications and other requirements specified below.

##### 1.4.1 Piezometer Tips

The tips of the piezometers shall be 2 inch O.D. PVC pipe with No. 15 slots or 0.015-inches.

##### 1.4.2 PVC Riser Pipe

Pipe shall be 3/4-inch PVC conforming to the requirements of ASTM D 1785, Schedule 80.

##### 1.4.3 PVC Adapter Couplings

Plastic adapter couplings shall be Schedule 80, 3/4-inch PVC fittings conforming to ASTM D 2467.

##### 1.4.4 Sand Backfill For Piezometer Tips

Sand backfill for piezometer tips shall be "Ottawa" sand.

##### 1.4.5 Impervious Backfill

Material shall be classified under the Unified Soil Classification System as CL or CH type material. The Unified Soil Classification System is identified on Drawing, C-8.

#### 1.4.6 Sealing Compound

Sealing compound placed around the 3-inch galvanized steel pipe placed through the concrete shall conform to SS-S-200.

#### 1.4.7 Solvent Compound

Solvent compound for assembling PVC pipe and couplings shall conform to ASTM D 2564.

#### 1.4.8 Steel Pipe

The 4-inch steel pipe shall be galvanized steel pipe conforming to the requirements of ASTM A 53, Schedule 40, fitted with a vented cap as indicated on the drawings.

### PART 2 PRODUCTS (Not Applicable)

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Piezometers shall be furnished and installed in accordance with details and at locations and elevations indicated on the drawings. Piezometers shall be placed in 6-inch diameter holes except as noted on Drawing C-6, drilled by rotary drilling method or other approved method which will insure proper placement of tip, riser pipe, sand around tip, and grout around riser pipe, where required. The 3-inch steel pipe and 6-inch Ferrules shall be constructed as shown on drawing C-6 through the concrete structure. The Contractor shall use a centering device or spider to center the piezometer tip in the hole. The use of a bentonitic type drilling fluid is prohibited. Drilling fluid additives similar and equal to "Revert" and "Fastbreak," products of Johnson Division, UOP, Inc., St. Paul, Minnesota 55104, may be used. Excavated material shall be disposed of as directed by the Contracting Officer. A temporary well casing of either iron or steel, new or used, may be used to support the sides of the hole during drilling and placement of tip, riser pipe and sand backfill. The temporary casing shall have an inside diameter of at least 6 inches and shall have sufficient thickness to retain its shape and maintain a true section throughout its depth and may be in sections of any convenient length. The temporary casing shall be such as to permit its removal without interfering with the fill or riser pipe. Subject to approval, the Contractor may set the temporary casing by any method which will not create a cavity around the outside of the temporary casing at any point along its entire length. If the temporary casing should become unduly distorted, its removal and the installation of new casing will be required at no additional cost to the Government. Except where the rotary method is used, temporary casing shall be carried to a minimum depth of 1-foot below the bottom elevation of the piezometer tips. After the piezometer tip and riser pipe have been placed, the sand shall be placed in an approved manner. The use of tremie will not be required. The temporary casing, if used, shall be raised in

increments not to exceed 2 feet, allowing the sand to flow out the bottom of the casing as more sand is placed in the top. Alternate placing of sand and withdrawing of temporary casing shall be continued until the sand has been placed to the required elevation. Piezometer tips shall be placed at the locations and elevations shown on the drawings. Piezometers will require a seal above the Ottawa sand of each piezometer. The seal will be placed as shown on the drawings. The seal shall be composed of a lean grout as specified by the Contracting Officer. The grout shall be placed as shown on drawing C-6. After installation of the piezometer and after the drilling additive, if used, has broken down, the Contractor shall perform a falling-head permeability test on the piezometer. The Contractor shall notify the Contracting Officer at least twenty four hours prior to the time each test is to be conducted. All falling-head permeability tests shall be made using clear, clean water. The data shall be recorded on Government-furnished WES Form 798 and submitted to the Contracting Officer in accordance with SECTION 00800 paragraph 1.14. A copy of WES Form 798 and an example of WES Form 798 are attached at the end of this section. The falling head test shall be as follows: An initial reading of the water level in the piezometer shall be recorded, even if the piezometer is dry, the piezometer shall be filled to the top of the pipe with water. The water level in the piezometer shall be recorded at one minute intervals for the first five minutes and at five minute intervals for an additional 15 minute period. Any piezometer which does not fall 50 percent of the distance to its original level within 5 minutes will not be accepted. If the test indicates that a piezometer is not functioning properly, the Contractor shall remove the piezometer, backfill the hole, and install the piezometer at another location all without additional cost to the Government. After tests indicate the piezometer to be functioning properly, a concrete collar shall be placed around the piezometer as shown on the drawings. The concrete shall conform to the requirements as specified in SECTION 02708, paragraph 3.4 CONCRETE. Where the pipes pass through the concrete, sealing compound shall be placed around the pipes sufficiently to effect a watertight seal.

-- End of Section --



PIEZOMETER INSTALLATION REPORT  
"EXAMPLE"

PROJECT: NASH RELIEF WELLS			LEVEE DISTRICT: LITTLE RIVER DRAINAGE DISTRICT					
LOCATION (STA): 13/13+25		OFFSET FROM CENTER LINE: 160 FEET		PIEZ NO.: 30				
PIEZ TYPE: <sup>OPEN PIEZOMETER</sup> 2" O.D. PVC (2' LENGTH) # 25 SLOBS		DEPTH OF PIEZ: 40 FT.		RISER PIPE DIAM: 3/4" DIA PVC				
PIEZ TIP SET IN (SOIL TYPE): SAND		SOIL SAMPLE NO.: NA		BORING DIAM: 6"				
METHOD OF INSTALLATION: DRILLING RIG - REVERSE ROTARY METHOD								
TYPE OF PROTECTION FOR PIEZ: 4" DIA SCH. 40 GALVANIZED PIPE & THREE WELL GUARD POSTS			VENT: 1/4" DIA HOLE IN 4" CAP					
GROUND ELEV: 334		ELEV TOP OF RISER: 337		ELEV PIEZ TIP: 294				
FILTER: OTTAWA SAND		FROM ELEV: 292		TO ELEV: 297.5				
SEAL: BENTONITE PELLET		FROM ELEV: 297.5		TO ELEV: 299.5				
INSTALLED BY: MEMPHIS DISTRICT		CONTRACT NO.: DACW 66		FOREMAN: LOUIS DYCHE				
DATE OF INSTALLATION: 17 JULY 1996			DATE OF OBSERVATIONS: 20 JULY 1996					
METHOD OF TESTING PIEZ: FALLING HEAD TEST								
TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
0730	0	12.2	0735	5	6.6			
	1	0.5'	0736	6	7.2			
0732	2	3.5'	0741	11	9.2			
0733	3	5.5	0746	16	10.8			
0734	4	6.1	0751	21	11.7			
REMARKS: STATIC WATER LEVEL 12.2 FEET BELOW TOP RISER PIPE								
PASSED FALLING HEAD TEST 7.2' > 6.1' @ 5 MINUTE MARK								
NOTE: IT MAY NOT BE POSSIBLE TO FILL PIEZOMETER TO THE TOP OF THE RISER PIPE								

CHIP NEWMAN

INSPECTOR

DIVISION 2 - SITE WORK

SECTION 02938

ESTABLISHMENT OF TURF

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DIVISION 2 - SITE WORK

SECTION 02938

ESTABLISHMENT OF TURF

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, equipment, and materials, and performing all operations necessary for establishment and mowing of turf on areas either as specified herein or as shown on the drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for turfing operations to assure compliance with the contract requirements and shall maintain records of his quality control for all construction operations, including, but not limited to, the following:

(1) Soil Testing

The tests are specified in paragraph 2.2.2 below.

(2) Preparation of Ground Surface

Location and quality of finish dressing, including necessary clearing, filling, or dressing out of washes, smoothness and uniformity of surfaces, and time of year.

(3) Fertilizing (and Liming)

Quality of materials, area fertilized (and limed), quantity applied, and method of application.

(4) Type of Turf

Quality, source, placing, covering, and compaction effort.

(5) Mulching (If Used)

Type of materials, area mulched, quantity applied, method of application.

(6) Maintenance and Repair

Location and type of maintenance problems and remedial treatment performed.

(7) Watering (If Used)

Quality of water, area watered, quantity applied, and method of application.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 AREAS TO BE TURFED

Turf shall be established on all surfaces of the embankments including the excess excavated material deposit area and all areas denuded of sod during construction operations with the exception of the channels and paved areas.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Fertilizer (and Limestone)

If the Contractor elects to use fertilizer, the fertilizer shall meet the requirements of the State of Missouri for commercial fertilizer. Quantity of fertilizer (and lime), if used, required per acre shall be determined by certified soil tests as specified in paragraph 2.2.2 below. Limestone shall be approved agricultural grade limestone containing not less than 85 percent total carbonates. Limestone shall be ground to such fineness that 25 percent will pass a 100-mesh sieve and 100 percent will pass an 8-mesh sieve.

2.1.2 Mulch

If the Contractor elects to use mulch to protect the turfed areas, the material used for mulching shall be materials that do not contain noxious grass or weed seed that might be detrimental to the turfing being established or to adjacent farmland.

2.1.3 Water

If the Contractor elects to use water as an aid to establish turf, the water used shall be free of injurious quantities of oil, acid, alkali, salt, and other substances harmful to growth of grass.

2.1.4 Spot Sod

If the Contractor elects to spot sod, the sod used to turf the areas specified shall contain a minimum of 85 percent Bermuda grass. Each piece of sod shall have an area of not less than 16 square inches and shall have not less than 2

inches of earth adhering to the roots. Sod that contains noxious grasses and weeds that might be detrimental to the turfing being established will not be acceptable.

#### 2.1.5 Sprigs

If the Contractor elects to sprig, the sprigs used to turf the areas specified shall consist of Bermuda grass. Sprigs that contain noxious grasses and weeds that might be detrimental to the turfing being established will not be acceptable.

#### 2.1.6 Soil for Repairs

For fill of areas to be repaired, soil shall be of a quality at least equal to that which exists in areas adjacent to the area to be repaired. Soil used shall be free from roots, stones, and other materials that hinder grading, planting, and maintenance operations and shall be free from objectionable weed seeds and toxic substances.

#### 2.1.7 Seeding

Seeding is not an option for turfing the newly constructed embankments.

### 2.2 SAMPLING AND TESTING

#### 2.2.1 General

Sampling and testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Sampling and testing shall be performed by a recognized testing agency.

#### 2.2.2 Soil Testing

Prior to beginning turfing operations, soil from the areas to be turfed shall be tested to determine soil nutrient and limestone requirements. At least one sample per acre shall be tested. Certified test results, and application rates for nitrogen, phosphorous, potash, and limestone (if required), indicated by the soil tests shall be furnished to the Contracting Officer prior to fertilizing.

#### 2.2.3 Material Testing

##### 2.2.3.1 Fertilizer and Limestone (If used)

Duplicate signed copies of invoices from suppliers shall be submitted to the Contracting Officer. Invoices for fertilizer shall show quantities and the percentages of nitrogen, phosphorous, and potash. If limestone is used, the limestone invoice shall show the quantity and the percentages of limestone that pass the 100- and 8-mesh sieves. Upon completion of the project, a final check of the total quantity of fertilizer used will be made against total area treated, and if minimum rates of application have not been met, an additional quantity of

material sufficient to make up the minimum application rate shall be distributed as directed.

### PART 3 EXECUTION

#### 3.1 COMMENCEMENT, PROSECUTION, AND COMPLETION

##### 3.1.1 General

The dressing and turfing operation for embankments shall commence as soon as practicable following the completion of construction in an area. Dressing and turfing operations on other areas shall commence upon completion of all work in that area. Prior to prosecuting the turfing operation, the Contractor shall repair rainwash, if any, dress, and prepare the areas for turfing. All turfing operations shall be accomplished during the season between 1 March and 30 June, or between 1 September and 15 November, inclusive, unless otherwise authorized by the Contracting Officer.

##### 3.1.2 Sequence of Work

The sequence of operations for work prescribed in this section shall be as follows:

- (1) Preparation of ground surface.
- (2) Fertilizing.
- (3) Spot sodding or sprigging.
- (4) Compacting, where applicable.

#### 3.2 PREPARATION OF GROUND SURFACE

##### 3.2.1 General

Equipment, in good condition, shall be provided for the proper preparation of the ground and for handling and placing all materials. Equipment shall be approved by the Contracting Officer before work is stated.

##### 3.2.2 Clearing

Prior to grading and finish dressing, vegetation that may interfere with turfing operations shall be removed and shall be disposed of as specified in Section 02226, paragraph 3.2. The surface shall be cleared of roots, cable, wire, and other materials that might hinder the work or subsequent maintenance.

### 3.2.3 Grading

Previously established grades and/or slopes and any other disturbed areas shall be prepared for fertilizing by finish dressing. Necessary repairs to previously graded areas shall be made with suitable material placed and compacted in accordance with SECTION 02226 paragraph 3.5.1. Suitable material for repairs may be obtained from the borrow area(s) obtained off site as specified in SECTION 02226 paragraph 3.4.

### 3.3 APPLICATION OF FERTILIZER AND/OR LIMESTONE (IF USED)

Fertilizer and limestone (if used) shall be distributed uniformly over the areas to be sprigged or spot sodded at the rate determined as specified in 2.2.2 above and shall be incorporated into the soil by light disking, harrowing, or other acceptable methods immediately following the application.

### 3.4 SPOT SODDING

If the Contractor elects to spot sod, the areas to be turfed shall be spot sodded with Bermuda grass in any manner selected by the Contractor to meet the coverage requirements set forth in paragraph 3.6.1 below.

### 3.5 SPRIGGING

If the Contractor elects to sprig, the areas to be turfed shall be sprigged with Bermuda grass in any manner selected by the Contractor to meet the coverage requirements set forth in 3.6.1 below.

### 3.6 ESTABLISHMENT

#### 3.6.1 General

Turfing will be considered to be completed when the areas to be turfed show that growth of the specified grass has reached a point of maturity such that it has produced stems or runners which overlap adjacent similar growth over 85 percent of the entire area as determined by random sampling on a square-yard basis with no bare spot exceeding 36 square inches.

#### 3.6.2 Maintenance

The Contractor shall be responsible for the turfed areas while grass is becoming established to the point of acceptance by the Contracting Officer. During establishment and prior to acceptance of the turfed areas, the Contractor shall repair rainwash damage, if any, to the completed embankment at no additional cost to the Government. The turfed areas shall be maintained by mowing for the life of the contract. Turfed areas shall be kept mowed to a height between 4 and 12 inches above the turfed earth surface. Should the Contractor fail to mow the

turfed areas to the limits as specified above, the Government will assume the responsibility for the mowing and deduct the cost thereof from any payments due the Contractor.

### 3.7 INSPECTION AND ACCEPTANCE

#### 3.7.1 General

Acceptance of the turfed areas will be determined by visual inspection. Existence of rainwash damage or dead and dying turf will not be acceptable.

#### 3.7.2 Areas Requiring Returfing

Areas being inspected for completion that do not meet the requirements for completion as specified hereinabove shall be returfed at no additional cost to the Government.

-- End of Section --

DIVISION 3 - CONCRETE

SECTION 03100

FORMWORK FOR CONCRETE

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DIVISION 3- CONCRETE

SECTION 03100

FORMWORK FOR CONCRETE

PART 1                    GENERAL

1.1    SCOPE

The work covered by this section consists of furnishing all material and equipment and performing all labor for formwork for concrete.

1.2    QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Materials

Conform to specification requirements.

(2) Installation

Conforms to specification requirements.

(3) Finish

Class of finish.

(4) Submittals

Timeliness and accuracy.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

### 1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

#### AMERICAN CONCRETE INSTITUTE (ACI) STANDARD.

ACI 347-89                      Formwork for Concrete Fifth Edition

#### U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS (NBS) PRODUCT STANDARD.

PS 1-83                         Construction and Industrial Plywood

### 1.4 SUBMITTALS

#### 1.4.1 Shop Drawings

Drawings for all formwork required shall be submitted at least 30 days before either fabrication on site or before delivery of prefabricated forms. The drawings and data submitted shall include the type, size, quantity of all materials of which the forms are made, details affecting the appearance, and the assumed design values and loading conditions.

#### 1.4.2 Manufacturer's Literature

Manufacturer's literature shall be submitted for plywood, form accessories, prefabricated forms, form coating, and form lining materials.

## PART 2                      PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Forms

#### 2.1.1.1 General

Forms shall be fabricated with facing materials that produce the specified construction tolerance requirements of Section 03301, paragraph 1.5.1 and the surface requirements of Section 03301, paragraph 1.5.2.

#### 2.1.1.2 Class "B" Finish

This class of finish shall apply to all surfaces except those specified to receive Class D. The sheathing shall be composed of tongue-and-groove or shiplap lumber, plywood conforming to NBS Product Standard PS 1, grade B-B concrete form, tempered concrete form hardboard, or steel. Steel lining on wood sheathing will not be permitted.

#### 2.1.1.3 Class "D" Finish

This class of finish shall apply to all surfaces against which backfill will be placed. The sheathing may be of wood or steel.

#### 2.1.2 Form Accessories

Ties and other similar form accessories to be partially or wholly embedded in the concrete shall be of a commercially manufactured type. After the ends or end fasteners have been removed, the embedded portion of metal ties shall terminate not less than 2-inches from any concrete surface either exposed to view or exposed to water. Plastic snap ties may be used in locations where the surface will not be exposed to view. Form ties shall be constructed so that the ends or end fasteners can be removed without spalling the concrete.

#### 2.1.3 Form Coating

Form coating shall be a commercial formulation of satisfactory and proven performance that will not bond with, stain or adversely affect concrete surfaces and will 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.

### PART 3 EXECUTION

#### 3.1 DESIGN

The design and engineering of the formwork, as well as its construction shall be the responsibility of the

Contractor. The formwork shall be designed for loads, lateral pressure and allowable stresses in accordance with Chapter 1 of ACI Standard 347. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall have sufficient rigidity to maintain specified tolerances.

### 3.2 INSTALLATION

Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements of SECTION 03301, paragraph 1.5.2 and conforming to construction tolerances of SECTION 03301, paragraph 1.5.1. Where concrete surfaces are to be permanently exposed to view, joints in form panels shall be arranged to provide a pleasing appearance. 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 re-used if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. All surfaces of forms and embedded materials shall be cleaned of any mortar from previous concreting and of all other foreign material before concrete is placed in them.

### 3.3 CHAMFERING

All exposed joints, edges and external corners shall be chamfered by molding placed in the forms unless the drawings specifically state that chamfering is to be omitted or as otherwise specified. Chamfered joints will not be permitted where earth or rockfill is placed in contact with concrete surfaces. Chamfered joints shall be terminated a sufficient distance outside the limit of the earth or rockfill so that the ends of the joints will be clearly visible.

### 3.4 COATING

Forms for exposed or painted surfaces shall be coated with form oil or a form-release agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions. Forms for unexposed 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.

### 3.5 REMOVAL

#### 3.5.1 General

Forms shall not be removed without approval of the Contracting Officer and all removal shall be

accomplished in a manner which will prevent injury to the concrete. Forms shall not be removed before the expiration of the minimum time indicated below, except as otherwise directed or specifically authorized. When conditions on the work are such as to justify the requirement, forms will be required to remain in place for a longer period. Form removal shall be scheduled so that all necessary repairs of concrete surfaces can be completed within 24 hours.

### 3.5.2 Unsupported Concrete

Formwork for vertical type forms not supporting the weight of concrete shall not be removed in less than 24 hours. The time depends on temperature, lift heights and type and amount of cementitious material in the concrete.

## 3.6 FIELD QUALITY CONTROL

Forms and embedded items shall be inspected in sufficient time prior to each concrete placement by the Contractor in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

--End of Section--

DIVISION 3 - CONCRETE

SECTION 03210

STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT

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DIVISION 3 - CONCRETE

SECTION 03210

STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT

PART 1                    GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all equipment, materials, and labor for providing and placing steel bars and accessories for concrete reinforcement.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Materials

Conform to specification requirements.

(2) Installation

Conforms to specification requirements.

(3) Shop Drawings and Test Reports

Accuracy, detail, timeliness of submission.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

### 1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

#### AMERICAN CONCRETE INSTITUTE (ACI) STANDARDS.

ACI 315-80 (R 1986)	Details and Detailing of Concrete Reinforcement
ACI 318/318R-89	Building Code Requirements for Reinforced Concrete

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS.

A 185-94	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
A 370-97	Mechanical Testing of Steel Products
A 615/A615M-96a	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

#### AMERICAN WELDING SOCIETY (AWS) CODE.

D1.4-79	Structural Welding Code Reinforcing Steel
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### 1.4 QUALITY ASSURANCE

#### 1.4.1 General

The Contractor shall have required material tests performed by an approved laboratory and certified to demonstrate that the materials are in conformance with the specifications. Tests shall be performed and certified at the Contractor's expense.

## 1.4.2 Reinforcement Steel Tests

Mechanical testing of steel shall be in accordance with ASTM A 370 except as otherwise specified herein or required by the material specifications. Tension tests shall be performed on full cross-section specimens, using a gage length that spans the extremities of specimens, with welds or sleeves included. The ladle analysis shall show the percentages of carbon, phosphorous, manganese, and sulfur present in the steel.

## 1.5 SUBMITTALS

### 1.5.1 General

The Contractor shall submit the following items to the Contracting Officer for approval.

### 1.5.2 Shop Drawings

Shop drawings shall be in accordance with specified requirements and include the following:

#### 1.5.2.1 Steel Schedules

Reinforcement steel schedules showing quantity, size, shape, dimensions, and bending details.

#### 1.5.2.2 Bar Supports

Details for bar supports showing types, sizes, spacing, and sequence.

### 1.5.3 Test Reports

Certified test reports of reinforcement steel showing that the steel complies with the applicable specifications shall be furnished for each steel shipment and identified with specific lots prior to placement.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Steel Bars

Billet-steel bars shall be deformed bars conforming to ASTM A 615, Grade 60, size and length as indicated on the drawings.

### 2.1.2 Welded Wire Fabric

Welded wire fabric shall conform to ASTM A 185.

### 2.1.3 Accessories

#### 2.1.3.1 Bar Supports

Bar supports shall conform to ACI 315. Bar supports for formed surfaces exposed to view or to be painted shall be plastic protected wire, or stainless steel.

#### 2.1.3.2 Wire Ties

Wire ties shall be 16-gage or heavier black annealed wire. Ties for epoxy coated bars shall be vinyl coated or epoxy coated.

## PART 3 EXECUTION

### 3.1 PLACEMENT

#### 3.1.1 General

Reinforcement steel and accessories shall be placed as specified and as shown on contract drawings and approved shop drawings. Placement details of steel and accessories not specified or shown on the drawings shall be in accordance with ACI 315 or ACI 318 or as directed by the Contracting Officer. Steel shall be fabricated to shapes and dimensions shown, placed where indicated within specified tolerances, and adequately supported during concrete placement. At the time of concrete placement all steel shall be free from loose, flaky rust, scale (except tight mill scale), mud, oil, grease, or any other coating that might reduce the bond with the concrete.

#### 3.1.2 Hooks and Bends

Steel shall be mill bent unless otherwise noted on drawings. All steel shall be bent cold unless otherwise authorized. No steel bars shall be bent after being partially embedded in concrete unless indicated on the drawings or otherwise authorized.

### 3.1.3 Welding

Welding of steel will be permitted only where indicated on the drawings or as otherwise directed by the Contracting Officer. Welding shall be performed in accordance with AWS D1.4, except where otherwise specified or indicated on the drawings.

### 3.1.4 Placing Tolerances

#### 3.1.4.1 Spacing

The spacing between adjacent bars and the distance between layers may not vary from the indicated position by more than one bar diameter nor more than one inch.

#### 3.1.4.2 Concrete Cover

The minimum concrete cover of main reinforcement steel shall be as shown on the drawings. The allowable variation for minimum cover shall be as follows:

<u>MINIMUM COVER</u>	<u>VARIATION</u>
6"	+ 1/2"
4"	+ 1/4"
3"	+ 1/4"
2"	+ 1/4"
1-1/2"	+ 1/4"
1"	+ 1/8"
3/4"	+ 1/8"

### 3.1.5 Welded-Wire Fabric

Welded-wire fabric shall be placed in the loft roof concrete with lap splices. Welded-wire fabric shall be placed in loft ceiling concrete approximately centered in concrete thickness as shown on the drawings. Fabric placed on grade shall be continuous. 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.

### 3.1.6 Splicing

#### 3.1.6.1 General

Splices in steel shall be made only as required. Bars may be spliced at alternate or additional locations at no additional cost to the Government, subject to the approval of the Contracting Officer.

#### 3.1.6.2 Lap Splices

Lap splices may be used except as noted on the drawings. Lapped bars may 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.

--End of Section--

DIVISION 3 - CONCRETE

SECTION 03301

CAST-IN-PLACE STRUCTURAL CONCRETE

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DIVISION 3 - CONCRETE

SECTION 03301

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all material and equipment and performing all labor for cast-in-place concrete except for related work specified in 1.1.2 below.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Materials

Conform to the specifications.

(2) Construction

Mixing, placing, finishing, curing, and protection.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

### 1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) WITH CORRESPONDING CRD STANDARD INDICATED WHERE AVAILABLE.

C 31/C 31M-96 (CRD-C 11)	Making and Curing Concrete Test Specimens in the Field
C 33-93 (CRD-C 133)	Concrete Aggregates
C 39-96 (CRD-C 14)	Compressive Strength of Cylindrical Concrete Specimens
C 94-96 (CRD-C 31)	Ready-Mixed Concrete and Ed.cmt.1
C143-90a	Slump of Hydraulic Cement Concrete
C 150-97 (CRD-C 201)	Portland Cement
C 171-97a (CRD-C 310)	Sheet Materials for Curing Concrete
C 172-90 (CRD-C 4)	Sampling Freshly Mixed Concrete

C 231-97 (CRD-C 41)	Air Content of Freshly Mixed Concrete by the Pressure Method
C 260-95 (CRD-C 13)	Air-Entraining Admixtures for Concrete
C 494-92 (CRD-C 87)	Chemical Admixtures for Concrete
C 566-97 (CRD-C 113)	Total Moisture Content of Aggregate by Drying
D 75-87 (CRD-C 155) (R 1992)	Sampling Aggregates and Editorial Cmt 1
E 329-95c (CRD-C 500)	Agencies Engaged in the Testing and/or Inspection of Materials used in Construction

CONCRETE PLANT MANUFACTURER'S BUREAU (CPMB)

Concrete Plant Standards (8th Rev., 1986 Prtg.)  
(CRD-C 95)

U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF  
STANDARDS (NBS) HANDBOOK

H44	Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices (1986)
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AMERICAN CONCRETE INSTITUTE (ACI)

ACI 305R-91

Hot Weather Concreting

U.S. ARMY CORPS OF ENGINEERS HANDBOOK FOR CEMENT AND  
CON-CRETE (CRD)

CRD-C 94-66

Surface Retarders

CRD-C 143-62

Meters for Automatic Indication of Moisture in Fine  
Aggregate

CRD-C 300-90

Membrane-Forming Compounds for Curing Concrete

CRD-C 400-63

Water for Use in Mixing or Curing Concrete

#### 1.4 QUALITY CONTROL

The Contractor will sample and test aggregates and concrete to determine compliance with the specifications. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with ASTM D 75. Concrete will be sampled in accordance with ASTM C 172. Slump and air content will be determined in accordance with ASTM C 231. Compression test specimens will be made and laboratory cured in accordance with ASTM C 31 and compression test specimens tested in accordance with ASTM C 39. Required compressive strength will be based on specimen breaks at 7 days (1 cylinder) and 28 days (2 cylinders).

#### 1.5 EVALUATION AND ACCEPTANCE

##### 1.5.1 Construction Tolerances

Variation in alignment, grade and dimensions of the structures from the established alignment, grade and dimensions shown on the drawings shall be minus 1/4-inch and plus 1/2-inch except that the deck slab shall be  $\pm$  1/8-inch.

## 1.5.2 Surface Requirements

The surface requirements for the classes of finish required by SECTION 03100, paragraph 2.1 shall be as hereinafter specified. Allowable irregularities are designated "abrupt" or "gradual" for purposes of providing for surface variations. Offsets resulting from displaced, misplaced or mismatched forms, or sheathing, or by loose knots in sheathing, or other similar form defects, shall be considered "abrupt" irregularities. Irregularities resulting from warping, unplaneness or similar uniform variations from planeness, or true curvature, shall be considered "gradual" irregularities. "Gradual" irregularities will be checked for compliance with the prescribed limits with a 5-foot template, consisting of a straightedge for plane surfaces and a shaped template for curved or warped surfaces. In measuring irregularities, the straightedge or template may be placed anywhere on the surface in any direction, with the testing edge held parallel to the intended surface.

<u>Class of Finish</u>	<u>Maximum Irregularities</u>	
	<u>Abrupt, inches</u>	<u>Gradual, inches</u>
B	1/4	1/2
D	1	1

## 1.5.3 Appearance

Permanently exposed surfaces shall be cleaned, if stained or otherwise discolored, by a method which does not harm the concrete and which is approved by the Contracting Officer.

## 1.6 SUBMITTALS

### 1.6.1 Test Reports

#### 1.6.1.1 Concrete Mixture Proportions

Concrete mixture proportions shall be determined by the Contractor and submitted for approval. The proportions of all ingredients and nominal maximum coarse aggregate size that will be used in the manufacture of the concrete shall be stated. Proportions shall indicate weight of cement and water and

weight of aggregates in a saturated surface-dry condition. The submission shall be accompanied by test reports from a laboratory complying with ASTM E 329 which show that proportions thus selected will produce concrete of the quality indicated. No substitution shall be made in the amount, source, or type of materials used in the work without additional tests to show that the new materials and quality of concrete are satisfactory.

#### 1.6.1.2 Cement

Cement will be accepted on the basis of manufacturer's certification of compliance, accompanied by mill test reports that materials meet the requirements of the specification under which it is furnished. Certification and mill test reports shall identify the particular lot furnished. No cement shall be used until notice of submittal receipt has been given by the Contracting Officer. Cement will be subject to check testing from samples obtained at the mill, at transfer points or at the project site, as scheduled by the Contracting Officer, and such sampling will be by or under the supervision of the Government at its expense. Material not meeting specifications shall be promptly removed from the site of work.

#### 1.6.2 Manufacturers' Certificates

##### 1.6.2.1 Accelerating Admixture

Accelerating admixture shall be certified for compliance with all specification requirements.

##### 1.6.2.2 Impervious Sheet Curing Materials

Impervious sheet curing materials shall be certified for compliance with all specification requirements.

##### 1.6.2.3 Air-Entraining Admixture

Air-entraining admixture shall be certified for compliance with all specification requirements.

##### 1.6.2.4 Water-Reducing Admixture

Water-reducing admixture shall be certified for compliance with all specification requirements.

#### 1.6.2.5 Curing Compound

Curing compound shall be certified for compliance with all specification requirements.

#### 1.6.3 Hot-Weather and Cold-Weather Requirements

##### 1.6.3.1 Cold-Weather Requirements

If concrete is to be placed under cold weather conditions, the proposed materials, methods and protection shall be in accordance with the requirements of 3.4.3 and 3.6.5 below for approval by the Contracting Officer.

##### 1.6.3.2 Hot-Weather Requirements

If concrete is to be placed under hot weather conditions, the proposed materials and methods shall be in accordance with the requirements of 3.4.4 and 3.5.1.2 below for approval by the Contracting Officer.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Cementitious Material

##### 2.1.1.1 General

Cementitious material shall be portland cement and shall conform to appropriate specifications listed in 2.1.1.2 below:

##### 2.1.1.2 Portland Cement

ASTM C 150, Type I, II or III.

## 2.1.2 Aggregates

Fine and coarse aggregates shall conform to the applicable requirements of ASTM C 33. Coarse aggregate shall conform to grading requirements for sizes 47.5, 75 or 150, as appropriate. The nominal maximum coarse aggregate size shall be as listed in 2.3.2 below.

## 2.1.3 Admixtures

### 2.1.3.1 General

Admixtures when permitted, by the Contracting Officer shall conform to the appropriate specification listed in 2.1.3.2, 2.1.3.3, and 2.1.3.4 below.

### 2.1.3.2 Air-Entraining Admixture

ASTM C 260; however, air-entraining admixture which has been in storage at the project site for longer than 6 months or which has been subjected to freezing shall not be used.

### 2.1.3.3 Accelerating Admixture

Accelerating admixture shall conform to the requirements as specified in ASTM C 494, type C.

### 2.1.3.4 Water Reducing or Retarding Admixtures

ASTM C 494, Type A, B or D.

## 2.1.4 Curing Materials

### 2.1.4.1 Impervious Sheet Materials

ASTM C 171, type optional except polyethylene film, if used, shall be white opaque.

#### 2.1.4.2 Membrane-Forming Curing Compound

CRD-C 300, pigmented or non-pigmented as required in 3.6.3 below. Non-pigmented compound shall contain a fugitive dye.

#### 2.1.5 Water

Water for mixing shall be fresh, clean, drinkable, and free of injurious amounts of oil, acid, salt and alkali except that undrinkable water may be used if it meets the requirements of CRD-C 400.

### 2.2 JOINTS

#### 2.2.1 Control and Contraction Joints

Contraction joints shall be of the weakened-plane dummy type. Contraction joints shall be one-fourth of the slab depth.

#### 2.2.2 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.

### 2.3 MIXTURE PROPORTIONING

#### 2.3.1 Quality

##### 2.3.1.1 Strength

Specified minimum compressive strength for cast-in-place concrete shall be 3,000 psi at 28 days.

### 2.3.1.2 Maximum Water-Cement Ratio

Maximum water-cement ratio shall be 0.55 by weight.

### 2.3.2 Nominal Maximum Size Coarse Aggregate

Nominal maximum size coarse aggregate shall be 1-1/2-inch.

### 2.3.3 Air Content

Air content as determined by ASTM C 231 shall be 5.0 percent  $\pm$  1.5 percent, except that when nominal maximum size coarse aggregate is 3/4-inch it shall be 6.0 percent  $\pm$  1.5 percent.

### 2.3.4 Slump

The slump shall be determined in accordance with ASTM C 143 and shall be within the range of 1 inch - 3 inches. Where placement by pump is approved, the slump shall not exceed 6 inches and shall remain within a 3-inch band.

## PART 3 EXECUTION

### 3.1 PRODUCTION OF CONCRETE

#### 3.1.1 Capacity

The batching, mixing and placing equipment shall have a capacity of at least 30 cubic yards per hour.

#### 3.1.2 Batching Plant

### 3.1.2.1 General

The batching plant shall conform to the requirements of the Concrete Plant Standards of CPMB and as specified; however, rating plates attached to batch plant equipment are not required.

### 3.1.2.2 Equipment

The batching controls shall be partially automatic or manual. Separate bins or compartments shall be provided for each size group of aggregate and cement. Aggregate shall be weighed either in separate weigh batchers with individual scales or cumulatively in one weigh batcher on one scale. Aggregate shall not be weighed in the same batcher with cement. If measured by weight, water shall not be weighed cumulatively with another ingredient. Water batcher filling and discharging valves shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. An accurate mechanical device for measuring and dispensing each admixture shall be provided. Each dispenser shall be interlocked with the batching and discharging operation of the water so that each admixture is separately batched and discharged automatically in a manner to obtain uniform distribution throughout the batch in the specified mixing period. Where use of truck mixers makes this requirement impracticable, the admixture dispensers shall be interlocked with the sand batcher. Admixtures will not be combined prior to introduction in water or sand. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment.

### 3.1.2.3 Scales

The weighing equipment shall conform to the applicable requirements of NBS Handbook 44, except that the accuracy shall be plus or minus 0.2 percent of scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring device. Scales and other measuring devices shall be tested for accuracy in the presence of a representative of the Contracting Officer prior to batching; however, a certified test report performed by an approved testing company within the past year will be accepted in lieu of the above test.

### 3.1.2.4 Batching Tolerances

#### 3.1.2.4.1 Weighing Tolerances

Whichever of the following tolerances is greater shall apply, based on required scale reading.

<u>Percent of Required Material</u>	<u>Percent of Scale Weight</u>	<u>Capacity</u>
Cementitious Materials	$\pm 1$	+0.3
Aggregate	$\pm 2$	+0.3
Water	$\pm 1$	+0.3
Admixture	$\pm 3$	+0.3

#### 3.1.2.4.2 Volumetric Tolerances

For volumetric batching equipment the following tolerances shall apply to the required volume of material being batched:

Water: Plus or minus 1 percent.

Admixtures: Plus or minus 3 percent.

#### 3.1.2.5 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture contents of the aggregates, and to change the weights of the materials being batched. The Contractor shall perform at least one moisture content test on each type of aggregate each day that concrete is placed. Additional tests shall be performed by the Contractor if so directed by the Contracting Officer. Tests shall be performed in accordance with ASTM C 566; however, tests on fine aggregate may be made with an electric moisture meter complying with the provisions of CRD-C 143 provided the sensing element is arranged so that measurement is made near the batcher charging gate of the sand bin or in the sand batcher.

#### 3.1.3 Mixers

##### 3.1.3.1 General

The mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and the mixer drums shall be kept free of hardened concrete. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired.

### 3.1.3.2 Concrete Plant Mixers

Concrete plant mixers shall be tilting, non-tilting, horizontal-shaft or vertical-shaft type and shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixing time shall conform to 3.1.3.3 below.

### 3.1.3.3 Truck Mixers

Truck mixers, the mixing of concrete therein, and concrete uniformity, shall conform to the requirements of ASTM C 94. A truck mixer may be used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer (shrink-mixed). Each truck shall be equipped with two counters from which it will be possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed.

## 3.2 CONVEYING EQUIPMENT

### 3.2.1 General

Concrete shall be conveyed from mixer to forms as rapidly as practicable and within the time interval in 3.4.2 below by methods which will prevent segregation or loss of ingredients. Any concrete transferred from one conveying device to another shall be passed through a hopper which is conical in shape and shall not be dropped vertically more than five feet, except where suitable equipment is provided to prevent segregation and where specifically authorized. Telephonic or other satisfactory means of rapid communication between the mixing plant and the forms in which concrete is being placed shall be provided and available for use by Government inspectors.

### 3.2.2 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least 5 times the nominal maximum size aggregate and the area of the gate opening shall be not less than two square feet. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically or hydraulically operated, except that buckets larger than 2 cubic yards shall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

### 3.2.3 Transfer Hoppers

Concrete may be charged into non-agitating hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles, and have conical-shaped discharge features. The machine shall be equipped with a hydraulically-operated gate and with a means of external vibration to effect complete and facile discharge. Concrete shall not be held in non-agitating transfer hoppers more than 30 minutes.

### 3.2.4 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94. Non-agitating equipment may be used for transporting plant-mixed concrete over a smooth road when hauling time is less than 15 minutes. Bodies of non-agitating equipment shall be smooth, watertight, metal containers equipped with gates that will permit the discharge of the concrete.

### 3.2.5 Chutes

When concrete can be placed directly from a truck mixer, agitator or non-agitating equipment, the chutes attached to this equipment may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete except when specifically approved.

### 3.2.6 Pump Placement

Concrete may be conveyed by positive displacement pump when approved by the Contracting Officer. The pumping equipment shall be piston or squeeze pressure type. The pipeline shall be rigid steel pipe or heavy duty flexible hose. The inside diameter of the pipe shall be at least three times the nominal maximum size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. The maximum size coarse aggregate will not be reduced to accommodate the pumps. The distance to be pumped shall not exceed limits recommended by the pump manufacturer. The concrete shall be supplied to the concrete pump continuously. When pumping is completed, concrete remaining in the pipeline shall be ejected without contamination of concrete in place. After each operation, equipment shall be thoroughly cleaned, and flushing water shall be wasted outside of the forms.

## 3.3 PREPARATION FOR PLACING

### 3.3.1 Embedded Items

Before placing concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Embedded items shall be free of oil and other foreign matter such as loose coatings or rust, paint and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids.

### 3.3.2 Concrete on Earth Foundations

Earth surfaces upon which concrete is to be placed shall be clean, damp, and free from frost, ice, and standing or running water. Prior to placing concrete the earth foundation shall have been compacted as required in SECTION 02222.

### 3.3.3 Construction Joint Treatment

#### 3.3.3.1 General

Concrete surfaces to which other concrete is to be bonded shall be prepared for receiving the next lift or adjacent concrete by cleaning with either air-water cutting, sandblasting, high pressure water jet, or other approved method; however, only approved wet sandblasting equipment shall be provided for wet sandblasting operations.

#### 3.3.3.2 Cleaning

##### 3.3.3.2.1 Air-Water Cutting

Air-water cutting of a construction joint shall be performed at the proper time and only on horizontal construction joints. The surface shall be cut with an air-water jet to remove all laitance and to expose clean, sound fine aggregate, but not so as to undercut the edges of the larger particles of aggregate. The air pressure used in the jet shall be 100 psi plus or minus 10 psi, and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. When approved by the Contracting Officer, a retarder complying with the requirements of CRD C 94 may be applied to the surface of the lift in order to prolong the period of time during which air-water cutting is effective. Prior to receiving approval, the Contractor shall furnish samples of the material to be used and shall demonstrate the method to be used in applications. After cutting, the surface shall be washed and rinsed as long as there is any trace of cloudiness of the wash water. The surface shall again be washed

just prior to placing the succeeding lift. Where necessary to remove accumulated laitance, coatings, stains, debris, and other foreign material, sandblasting will be required as the last operation before placing the next lift.

#### 3.3.3.2.2 High-Pressure Water Jet

A stream of water under a pressure of not less than 3000 psi may be used for cleaning. Its use shall be delayed until the concrete is sufficiently hard so that only the surface skin or mortar is removed and there is no undercutting of coarse aggregate particles. Where the cleaning occurs more than two days prior to placing the next lift or where the work in the area subsequent to the cleaning causes dirt or debris to be deposited on the surface, the surface shall be cleaned again as the last operation prior to placing the next lift. If the water jet is incapable of a satisfactory cleaning, the surface shall be cleaned by sandblasting.

#### 3.3.3.2.3 Sandblasting

When employed in the preparation of construction joints, sandblasting shall be performed as the final operation completed before placing the following lift. The operation shall be continued until all accumulated laitance, coatings, stains, debris, and other foreign materials are removed. The surface of the concrete shall then be washed thoroughly to remove all loose materials. The surface shall again be washed just prior to placing the succeeding lift.

#### 3.3.3.2.4 Waste Disposal

The method used in disposing of waste water employed in cutting, washing and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. Method of disposal shall be subject to approval by the Contracting Officer and comply with environmental requirements.

### 3.4 PLACING

#### 3.4.1 General

Concrete placement will not be permitted when, in the opinion of the Contracting Officer, weather conditions prevent proper placement and consolidation. Concrete shall be deposited as close as possible to its final position in the forms, and in so depositing there shall be no vertical drop greater than five feet. Depositing of the concrete shall be so regulated that it may be effectively consolidated in horizontal layers 1-1/2 feet or less in thickness with a minimum of lateral movement. The amount deposited in each location shall be that which can be readily and thoroughly consolidated. The surfaces

of construction joints shall be kept continuously wet for the first twelve hours during the twenty-four hour period prior to placing concrete. Free water shall be removed prior to placement of concrete. Sufficient placing capacity shall be provided so that concrete placement can be kept plastic and free of cold joints while concrete is being placed.

#### 3.4.2 Time Interval Between Mixing and Placing

Concrete shall be placed within thirty minutes after discharge into non-agitating equipment. When concrete is truck mixed or when a truck mixer or agitator is used for transporting concrete mixed by a concrete plant mixer, the concrete shall be delivered to the site of the work and placed in the forms within 1-1/2 hours after introduction of the cement to the aggregates. When the length of haul makes it impossible to deliver truck mixed concrete within these time limits, batching of cement and a portion of the mixing water shall be delayed until the truck mixer is at or near the construction site. Not more than 80 percent of the water and all other materials except cement shall be batched at the distant batch plant and transported to the cement batcher without mixing.

#### 3.4.3 Cold-Weather Placing

Concrete shall not be placed without a procedure approved in accordance with 1.5.3.1 above when the concrete is likely to be subjected to freezing temperatures before the expiration of the curing period. The ambient temperature of the space adjacent to the concrete placement and surfaces to receive concrete shall be above 32 degrees F. The placing temperature of the concrete having a minimum dimension less than 12 inches shall be between 60 degrees and 75 degrees F. The placing temperature of the concrete having a minimum dimension greater than 12 inches shall be between 50 degrees and 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperatures. Materials entering the mixer shall be free from ice, snow or frozen lumps. Salt, chemicals or other materials shall not be mixed with the concrete to prevent freezing, except that calcium chloride may be used as an accelerator.

#### 3.4.4 Hot-Weather Placing

Concrete shall be properly placed and finished with approved procedures in accordance with 1.5.3.2 above. The concrete placing temperature shall not exceed 85 degrees F. Cooling of the mixing water and/or aggregates will be required to obtain an adequate placing temperature. An approved retarder may be used to facilitate placing and finishing. Steel forms and reinforcement shall be cooled prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete placing temperature.

### 3.4.5 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrating equipment. Vibrators will not be used to transport concrete within the forms. Hand spading may be required if necessary with internal vibration along formed surfaces permanently exposed to view. Form or surface vibrators shall not be used unless specifically approved. Vibrators of the proper size, frequency and amplitude shall be used for the type of work being performed in conformance with the following requirements:

<u>Application</u>	<u>Head Diameter (Inches)</u>	<u>Frequency VPM</u>	<u>Amplitude (Inches)</u>
General Construction	2 - 3-1/2	8000-12000	0.025-0.05

The frequency and amplitude shall be within the range indicated in the table above. The vibrator shall be inserted vertically at uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if such exists. It shall be held stationary until the concrete is consolidated and then withdrawn slowly.

## 3.5 FINISHING

### 3.5.1 Unformed Surfaces

#### 3.5.1.1 General

The ambient temperature of spaces adjacent to surfaces being finished shall be not less than 50 degrees F. All unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, unless a steel trowel finish is specified, and shall be true to the elevations shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to elevation shown on the drawings and left true and regular. Exterior surfaces shall be sloped for drainage unless otherwise shown on the drawings or as directed. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions.

#### 3.5.1.2 Hot Weather

In hot weather when the rate of evaporation of surface moisture, as determined by use of Figure 2.1.5

of ACI 305, may reasonably be expected to exceed 0.2 pounds per square foot per hour, provision for windbreaks, shading, fog spraying, or wet covering with a light colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as finishing operations will allow.

### 3.5.1.3 Float Finish

Surfaces shall be screeded and darbied or bullfloated to bring the surface to the required finish level with no coarse aggregate visible. No cement or mortar shall be added to the surface during the finishing operation. The concrete, while still green but sufficiently hardened to bear a man's weight without deep imprint, shall be floated to a true and even plane. Floating may be performed by use of hand or power driven equipment. Hand floats shall be made of magnesium or aluminum. Tolerance for a floated finish shall be true plane within 1/8-inch in ten feet as determined by a 10-foot straight-edge placed anywhere on the slab in any direction.

### 3.5.1.4 Trowel Finish

A steel trowel finish shall be applied to the exposed surfaces of the tops of the walls. Concrete surfaces shall be finished with a float finish and after surface moisture has disappeared, the surface shall be steel-troweled to a smooth, even, dense finish free from blemishes including trowel marks.

### 3.5.1.5 Broom Finish

A broom finish shall be applied to exposed surfaces of the 4" and the 12" concrete slabs. Such surfaces shall be finished with a float finish and trowel finish and then shall be broomed when the concrete has hardened sufficiently. The broom shall be a fiber-bristle brush of an approved type. The strokes shall be square across the slab, from edge to edge, with adjacent strokes slightly overlapped, and shall be made by drawing the broom without tearing the concrete, but so as to produce regular corrugations not over 1/8-inch in depth. The surface as thus finished shall be free from porous spots, irregularities, depressions, and small pockets or rough spots such as may be caused by accidental disturbance, during the final brooming, of particles of coarse aggregate embedded near the surface.

## 3.5.2 Formed Surfaces

### 3.5.2.1 General

Surfaces, unless other type of finish is specified, shall be left with the texture imparted by the forms except defective surfaces shall be repaired as described in 3.5.2.2 below. Unless painting of surfaces is

required, uniform color shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure which is exposed to view or on which a special finish is required. Forms shall not be reused if there is any evidence of surface wear or defects which would impair the quality of the surface.

### 3.5.2.2 Repair of Surface Defects

After form removal, all fins and loose materials shall be removed. All voids, and honeycombs exceeding 1/2 inch in diameter and all tie rod holes permanently exposed to view shall be reamed or chipped and filled with dry pack mortar. Defective areas larger than 36 square inches in any surface, permanently exposed or not, shall be delineated in a rectangular shape by a saw cut a minimum depth of 1-inch and repaired with concrete replacement. The cement used in the mortar or concrete for all surfaces permanently exposed to view shall be a blend of portland cement and white cement properly proportioned so that the final color when cured will be the same as adjacent concrete. Temperature of the concrete, ambient air, replacement concrete or mortar during remedial work including curing shall be above 50 degrees F. The prepared area shall be dampened, brush-coated with a neat cement grout or with an approved epoxy resin, and filled with mortar or concrete. The mortar shall consist of 1 part cement to 2-1/2 parts fine aggregate. The quantity of mixing water shall be the minimum necessary to obtain a uniform mixture and permit placing. Mortar shall be thoroughly compacted in place and struck off to adjacent concrete. Replacement concrete shall be drier than the usual mixture and thoroughly tamped into place and finished. Forms shall be used if required. Metal tools shall not be used to finish permanently exposed surfaces. The patched areas shall be cured for seven days.

## 3.6 CURING AND PROTECTION

### 3.6.1 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 temperature, rapid temperature change, and mechanical injury. All materials and equipment needed for adequate curing and protection shall be available and at the placement site prior to start of concrete placement. Concrete shall be protected from the damaging effects of rain for 12 hours and flowing water for 14 days. No fire or excessive heat shall be permitted near or in direct contact with concrete at any time.

### 3.6.2 Moist Curing

Concrete moist-cured shall be maintained continuously (not periodically) wet for the entire curing period. If water or curing materials used stain or discolor concrete surfaces which are to be permanently exposed, they shall be cleaned as required in 1.5.3 above. When wooden form sheathing

is left in place during curing, the sheathing shall be kept wet at all times. Horizontal surfaces shall be cured by ponding, by covering with a minimum uniform thickness of 2 inches continuously saturated sand, or by covering with saturated non-staining burlap or cotton mats or sealed impervious sheet materials. Horizontal construction joints may be allowed to dry for 12 hours immediately prior to placing of the following lift.

### 3.6.3 Membrane Curing

Concrete may be cured with an approved curing compound in lieu of moist curing except that membrane curing will not be permitted on any surface containing protruding steel reinforcement.

A pigmented type curing compound conforming to CRD-C 300 may be used on surfaces which will not be exposed to view when the project is completed. A non-pigmented type curing compound, containing a fugitive dye, conforming to CRD-C 300 with the reflective requirements waived may be used on surfaces which will be exposed to view when the project is completed. In hot weather, concrete cured with the non-pigmented type shall be shaded from the direct rays of the sun for the first 3 days of the curing period.

The curing compound shall be applied to formed surfaces immediately after the forms are removed and all necessary repairs have been performed. Immediately after the removal of forms, all surfaces shall be kept continuously wet until repairs have been performed and curing compound applied. The surfaces shall be thoroughly moistened with water and the curing compound applied as soon as free water disappears. The curing compound shall be applied to unformed surfaces as soon as free water has disappeared. The curing compound shall be applied in a 2-coat continuous operation by approved motorized power-spraying equipment and at a uniform coverage of not more than 400 square feet per gallon for each coat. 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 herein specified. All concrete surfaces on which the curing compound has been applied shall be adequately protected for the duration of the entire curing period from pedestrian and vehicular traffic and from any other cause which will disrupt the continuity of the curing membrane.

### 3.6.4 Impervious-Sheet Curing

Horizontal or near horizontal surfaces may be cured using impervious sheets. All surfaces shall be thoroughly wetted and be completely covered with waterproof paper, polyethylene film or with polyethylene-coated burlap having the burlap thoroughly water-saturated before placing. Covering shall be laid with light colored side up. Covering shall be lapped not less than 12 inches and securely weighted down or shall be lapped not less than 4 inches and taped to form a continuous cover with completely closed joints. The sheet shall be weighted to prevent displacement so that it remains in contact with the concrete during the specified length of curing. Coverings shall be folded down over

exposed edges of slab and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

### 3.6.5 Cold Weather

When the daily outdoor low temperature is less than 32 degrees F, the temperature of the concrete shall be maintained above 40 degrees F for at least the first three days and above 32 degrees F for the remainder of the required curing period. In addition, during the period of protection removal, the air temperature adjacent to the concrete surfaces shall be controlled so that concrete near the surface will not be subjected to a temperature differential of more than 25 degrees F as determined by observation of ambient and concrete temperatures indicated by suitable thermometers furnished by the Contractor as required and installed adjacent to the concrete surface and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the Contractor at such locations as may be directed. Curing compounds shall not be used on concrete surfaces which are maintained at curing temperature by use of free steam.

## 3.7 CONCRETE SLABS

Concrete slabs for stair landings, diesel generator, and fuel tank shall be constructed to the lines and grades as shown on the drawings. The Contractor may use the same mix design as that used for the Pumping Station. The Contractor shall submit shop drawings showing details of the forms to the Contracting Officer for approval.

--End of Section--

DIVISION 4 - MASONRY

SECTION 04200

MASONRY WALL

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DIVISION 4 - MASONRY

SECTION 04200

MASONRY WALL

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, equipment, labor and materials and performing all operations in connection with the installation of all masonry as indicated on the drawings and/or as specified herein.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including, but not limited to the following:

(1) Material

Materials shall conform to the respective specifications and other requirements specified hereinafter.

(2) Placement

Conforms to lines, grades, and sections as shown on the drawings and to the specifications hereinafter.

A copy of these records and tests, as well as the records of corrective action taken, will be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

C 90-97	Loadbearing Concrete Masonry Units
C 94-96 And Ed. Cmt. 1	Ready Mixed Concrete
C 144-93	Aggregate for Masonry Mortar
C 270-97	Mortar for Unit Masonry
C 404-95	Aggregate for Masonry Mortar

1.4 MATERIALS

1.4.1 General

Materials shall conform to the respective specifications and other requirements specified hereinafter or if no reference is made to a specific material or item, then the material or item shall be of the highest quality consistent with this type of work.

1.4.2 Rigid Steel Anchors

The rigid steel anchors shall be one inch wide by 1/4-inch thick with ends turned in opposite directions not less than 3 inches for setting into filled cells, and with not less than 24 inches between turned ends.

1.4.3 Joint Reinforcement

All joint reinforcement wire construction shall be not lighter than 9 gage. The reinforcement in concrete - masonry - unit wall or partitions shall be ladder or truss design, having 2 or more deformed or smooth longitudinal wires. Reinforcement used for wall ties shall be continuous type of truss, or ladder design having deformed longitudinal wires. Longitudinal wires shall be spaced 2 inches plus or minus 1/8 inch less than the nominal width of the unit or wall in which placed. The distance between contacts of crosswires with each outermost longitudinal wire of ladder or truss designs shall not exceed 6 inches for smooth longitudinal wires and 16 inches for deformed longitudinal wires. Joint reinforcement for straight runs shall be furnished in flat sections not less than 10 feet long. Factory formed pieces shall be provided at corners and intersections of walls and partitions.

1.4.4 Concrete Masonry Units

Hollow units conforming to ASTM specifications C 90, Type I, Grade N-I shall be used. The units shall be of dimensions that will lay up to 8-inch modules. The units shall include closer, jamb, corner, lintel units and any special shapes and sizes required to complete the work indicated on the drawings. Units having a bullnoze of 1-inch radius, shall be used throughout interior spaces at vertical external corners of interior concrete-masonry-unit walls and partitions that will

be exposed to view except at door jambs, window jambs and louvers.

#### 1.4.5 Mortar

The mortar shall conform to the requirements of ASTM C 270, Type N. The cement shall be of one brand and the aggregate shall be from one source, 100 percent passing the No. 8 sieve and 95 percent passing the No. 16 sieve. An admixture, other than antifreeze compounds, may be used in the mortar subject to the approval of the Contracting Officer. The admixture shall not adversely affect mortar bond or compressive strengths of mortar designed without use of admixture. The admixture shall not contain calcium chloride, chloride salts, or any other chemical that will deleteriously affect metals in mortar including coatings embedded on metal. The color of the mortar shall blend with the adjoining materials and shall be subject to approval of the Contracting Officer.

#### 1.4.6 Grout

The aggregate for grout shall conform to the requirements of ASTM C404 or C144. The grout shall be mixed in laboratory established proportions and shall attain a 28-day compressive strength of not less than 3,000 psi when tested per ASTM C91 for fine aggregate. The fine grout shall be of portland cement, lime paste or hydrated lime, and fine aggregate mixed with water and shall obtain a pouring consistency without segregation of the formula. The slump shall be between 9 and 11 inches. All mixing shall conform to ASTM C94.

#### 1.4.7 Concrete

Concrete if used to fill any of the cells in the wall shall have a design strength of at least 3000 psi and shall conform to ASTM C 94.

#### 1.4.8 Reinforcing Steel Bars and Rods

The reinforcing steel bars and rods shall conform to the requirements as specified in SECTION 03210.

#### 1.4.9 Certificates

Certificates shall be submitted in accordance with SECTION 00800, paragraph 1.14, prior to delivery of the certified material to the project site. The concrete masonry units shall be certified for compliance with all specification requirements.

#### 1.4.10 Handling and Storage

Materials shall be handled, stored, and protected in an approved manner to avoid chipping, breakage, contact with soil or contaminating material, and exposure to the elements. Concrete masonry units shall be delivered to the jobsite in air-dry condition. Anchors, ties, and joint reinforcement shall be kept free of rust. Steel reinforcing bars or rods shall be free of loose scale and rust.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 EXECUTION

3.1.1 General

No unit having a film of water or frost on its surface shall be laid. Masonry shall be laid plumb, true to line with level courses accurately spaced. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Vertical joints shall be shoved tight. Each unit shall be adjusted to final position while mortar is still soft and plastic. Any unit that is disturbed after mortar has stiffened shall be removed and relaid with fresh mortar. The sizes of any two adjacent units shall be within permitted tolerances so that the difference between the vertical faces of such units shall not exceed 1/8 inch in exposed-to-view walls and partitions. Units in exposed-to-view walls and partitions shall be free from chipped edges or other imperfections detracting from the appearance of the finished work. Masonry erected when the ambient air has a temperature of more than 99 degrees F., in the shade, and has a relative humidity of less than 50 percent shall be protected from direct exposure to wind and sun for 48 hours after installation. In hot or dry weather the masonry shall be kept wet for a period of at least 3 days after completion. When the temperature is 40 degrees F and falling, all masonry work shall cease.

3.1.2 Cutting and Fitting

The cutting and fitting of masonry units including that required to accommodate the work of others, shall be done by masonry mechanics. Wherever possible, full units of the proper size shall be used in lieu of cut units. Cut edges shall be clean, true, and sharp. Openings shall be carefully cut, formed, or otherwise neatly made for recessed items and for electrical, plumbing, or other mechanical installations so that wall plates, cover plates, or escutcheons required by the installation will completely conceal the openings and will have bottoms in alinement with lower edge of masonry joints. Webs of hollow masonry units shall be cut the minimum required for the structural steel lintels where not exposed-to-view shall be provided above openings over 12 inches wide for pipe, and ducts unless steel sleeves are used.

3.1.3 Embedded Items

Spaces around built-in items shall be filled solidly with mortar. Anchors, wall plugs, accessories, flashings, pipe sleeves, and other items required to be built in shall be built in as the masonry work progresses. Anchors, and joint reinforcement shall be fully embedded in mortar. Cells receiving anchor bolts

and cells of first masonry course below bearing plates shall be filled solidly with mortar or grout.

#### 3.1.4 Unfinished Work

Any unfinished work of masonry units shall be stepped back for joining with new work. Tothing may be resorted to only when specifically approved. Before laying new work, loose mortar shall be removed and the exposed joint shall be thoroughly cleaned.

#### 3.1.5 Protection

Surfaces of masonry not being worked on shall be properly protected at all times. When rain or snow is imminent, the tops of exposed masonry shall be covered. If imminent, the tops of exposed masonry shall be covered with a strong nonstaining waterproof membrane well secured in place and in a manner that will prevent moisture from accumulating within the unfinished wall. Adequate provisions shall be made during construction to prevent damage by wind.

#### 3.1.6 Mortar

Mortar shall be placed in final position within 2-1/2 hours after mixing. Mortar not used or that has started to set within this time interval shall be discarded.

#### 3.1.7 Joints

Joints in exposed-to-view walls and partitions and joints to be pointed, caulked, or sealed, shall be tooled slightly concave or flush to match adjacent joints, thoroughly compacted, and pressed against the edges of the units. Tooling shall be done when the mortar is thumbprint hard. The tooled joints shall be finished to uniformly straight and true lines and surfaces, smooth and free of tool marks.

Joints for blocks shall be not less than 3/16-inch or more than 1/4-inch. The joints for stone facing shall vary from 1/2-inch minimum to 2 1/2-inch maximum.

#### 3.1.8 Concrete Masonry Units

The concrete masonry units shall not be wetted before laying. Cutting of units shall be with power masonry saws. Concrete units may be either dry or wet cut. Wet-cut units, before being placed in the work, shall be dried to same surface-dry appearance as uncut units being laid in the wall. Units shall be laid in running bond so that vertical joints between units will be located over the center of the units in the next course below and in alignment from bottom to top of wall. Joint reinforcement shall be spaced not over 16 inches on centers vertically. Units shall be full bedded in mortar under both face shells and webs under starting courses on solid foundation walls, and lintels, and where cells are to be filled with grout or concrete. Other units shall be full bedded under both face shells, but mortar shall not extend through the unit on web edges except where anchors occur. No piece shorter than 4 inches shall be used at any vertical corner or jamb. All headjoints shall be filled solidly with mortar for a distance in from the face of the unit or wall not less than the thickness of

the longitudinal face shell. Jamb units shall be of the shapes and sizes to bond with wall units. No cells shall be left open in the face surfaces. Small-mesh wire fabric or expanded metal shall be embedded in mortar below cells of hollow units receiving mortar, grout, or concrete fill. Hollow masonry units in walls or partitions supporting plumbing or other mechanical fixtures, voids at door and window jambs, and other spaces requiring fill shall be filled solid with grout, mortar, or concrete. Cells under lintel bearings on each side of openings shall be filled solid with grout, mortar, or concrete for full height of openings. One cell of two-cell units and two cells of three-cell units shall be filled each side of jambs when lintel bearings are 8 inches. Solid units may be used instead of hollow units filled with grout, mortar, or concrete, except for installations requiring embedment of anchors in cells of hollow units.

#### 3.1.8.1 Masonry Wall Intersections

Each course shall be masonry bonded at exterior corners. At other intersections, masonry walls or partitions shall be anchored together. At intersections, masonry walls shall be tied together with rigid steel anchors spaced not over 24 inches on centers vertically with turned ends of anchors embedded in cells of units filled solid with mortar.

#### 3.1.8.2 Lintels

When constructed of concrete masonry units, lintels may be specially formed U-shaped units filled solid with concrete and reinforced as approved by the Contracting Officer. Lintels shall extend beyond each side of masonry openings at least 8 inches. Lintels shall be set with faces plumb and true, in a full bed of mortar and blanchied up as necessary to provide a full 3/8-inch clearance above top of frames.

#### 3.1.9 POINTING AND CLEANING

Mortar daubs or splashings, before setting or hardening, shall be completely removed from masonry-unit surfaces that will be exposed. Before completion of the work, all defects in joints of masonry to be exposed shall be raked out as necessary, filled with mortar, and tooled to match existing joints. 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.

#### 3.1.10 CELLS

All of the cells in the 8-inch wide concrete block wall shall be filled with either grout or concrete as directed by the Contracting Officer.

--End of Section--

DIVISION 5 – METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05101

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS

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DIVISION 5 - METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05101

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS

PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123-89a And Ed. Cmt. 1	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Product
ASTM A 380-96	Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
ASTM A 514/A 514M-94a	High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding
ASTM A 780-93a	Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM E 94-93	Radiographic Testing
ASTM E 165-95	Liquid Penetrant Examination Inspection Method
ASTM E 446-93	Radiographs for Steel Casting up to 2 in. (51 mm) in Thickness
ASTM E 709-95	Magnetic Particle Examination

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B4.1 Parts	(1967; R 1994) Preferred Limits and Fits for Cylindrical Parts
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ASME B46.1 (1985) Surface Texture (Surface Roughness, Waviness, and Lay)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1994) Structural Welding Code - Steel

1.2 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Detail Drawings; GA.

Detail drawings for metalwork and machine work shall be submitted and approved prior to fabrication.

SD-07 Schedules

Materials Orders; FIO.

Copies of purchase orders, mill orders, shop orders and work orders for materials shall be submitted prior to the use of the materials in the work.

Materials List; FIO.

Materials list for fabricated items shall be submitted at the time of submittal of detail drawings.

Shipping Bill; FIO.

Shipping bill shall be submitted with the delivery of finished pieces to the site.

SD-08 Statements

Welding Procedures for Structural Steel; GA.

Schedules of welding procedures for steel structures shall be submitted and approved prior to

commencing fabrication.

Structural Steel Welding Repairs; GA.

Welding repair plans for steel shall be submitted and approved prior to making repairs.

#### SD-09 Reports

Tests, Inspections, and Verifications; FIO.

Certified test reports for materials shall be submitted with all materials delivered to the site.

#### SD-13 Certificates

Qualification of Welders and Welding Operators; FIO.

Certifications for welders and welding operators shall be submitted prior to commencing fabrication.

### 1.3 METALWORK AND MACHINE WORK DETAIL DRAWINGS

Detail drawings for metalwork and machine work shall include catalog cuts, templates, fabrication and assembly details and type, grade and class of material as appropriate. Elements of fabricated items inadvertently omitted on contract drawings shall be detailed by the fabricator and indicated on the detail drawings.

### 1.4 QUALIFICATION OF WELDERS AND WELDING OPERATORS

The Contractor shall certify that the qualification of welders and welding operators and tack welders who will perform structural steel welding have been qualified for the particular type of work to be done in accordance with the requirements of AWS D1.1, Section 5, prior to commencing fabrication. The certificate shall list the qualified welders by name and shall specify the code and procedures under which qualified and the date of qualification. Prior qualification will be accepted if welders have performed satisfactory work under the code for which qualified within the preceding three months. The Contractor shall require welders to repeat the qualifying tests when their work indicates a reasonable doubt as to proficiency. Those passing the requalification tests will be recertified. Those not passing will be disqualified until passing. All expenses in connection with qualification and requalification shall be borne by the Contractor.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Materials Orders

The Contractor shall furnish four copies of purchase orders, mill orders, shop orders and work orders for all materials orders and items used in the work. Where mill tests are required purchase orders shall contain the test site address and the name of the testing agency.

#### 2.1.2 Materials List

The Contractor shall furnish a materials list of the materials to be used in the fabrication of each item.

#### 2.1.3 Shipping Bill

The Contractor shall furnish a shipping bill or memorandum of each shipment of finished pieces or members to the project site giving the designation mark and weight of each item, the number of items, the total weight, and the car initial and number if shipped by rail in carload lots. Duplicate copies shall be given to the Contracting Officer.

### 2.2 FABRICATION

#### 2.2.1 Structural Fabrication

Material must be straight before being laid off or worked. If straightening is necessary it shall be done by methods that will not impair the metal. Sharp kinks or bends shall be cause for rejection of the material. Material with welds will not be accepted except where welding is definitely specified, indicated or otherwise approved. Bends shall be made by approved dies, press brakes or bending rolls. Where heating is required, precautions shall be taken to avoid overheating the metal and it shall be allowed to cool in a manner that will not impair the original properties of the metal. Proposed flame cutting of material other than structural steel shall be subject to approval and shall be indicated on detail drawings. Shearing shall be accurate and all portions of the work shall be neatly finished. Corners shall be square and true unless otherwise shown. Re-entrant cuts shall be filleted to a minimum radius of 19 mm (3/4 inch) unless otherwise approved. Finished members shall be free of twists, bends and open joints. Bolts, nuts and screws shall be tight.

##### 2.2.1.1 Dimensional Tolerances for Structural Work

Dimensions shall be measured by an approved calibrated steel tape of approximately the same temperature as the material being measured. The overall dimensions of an assembled structural

unit shall be within the tolerances indicated on the drawings or as specified in the particular section of these specifications for the item of work. Where tolerances are not specified in other sections of these specifications or shown, an allowable variation of 1 mm (1/32 inch) is permissible in the overall length of component members with both ends milled and component members without milled ends shall not deviate from the dimensions shown by not more than 2 mm (1/16 inch) for members 9 m (30 feet) or less in length and by more than 3 mm (1/8 inch) for members over 9 m (30 feet) in length.

#### 2.2.1.2 Structural Steel Fabrication

Structural steel may be cut by mechanically guided or hand-guided torches, provided an accurate profile with a surface that is smooth and free from cracks and notches is obtained. Surfaces and edges to be welded shall be prepared in accordance with AWS D1.1, Subsection 3.2. Where structural steel is not to be welded, chipping or grinding will not be required except as necessary to remove slag and sharp edges of mechanically guided or hand-guided cuts not exposed to view. Hand-guided cuts which are to be exposed or visible shall be chipped, ground or machined to sound metal.

#### 2.2.2 Welding

##### 2.2.2.1 Welding of Structural Steel

- a. Welding Procedures for Structural Steel - Welding procedures for structural steel shall be prequalified as described in AWS D1.1, Subsection 5.1 or shall be qualified by tests as prescribed in AWS D1.1, Section 5. Properly documented evidence of compliance with all requirements of these specifications for previous qualification tests shall establish a welding procedure as prequalified. For welding procedures qualified by tests, the test welding and specimen testing must be witnessed and the test report document signed by the Contracting Officer. Approval of any welding procedure will not relieve the Contractor of the responsibility for producing a finished structure meeting all requirements of these specifications. The Contractor will be directed or authorized to make any changes in previously approved welding procedures that are deemed necessary or desirable by the Contractor Officer. The Contractor shall submit a complete schedule of welding procedures for each steel structure to be welded. The schedule shall conform to the requirements specified in the provisions AWS D1.1, Sections 2, 3, 4, 7 and 9 and applicable provisions of Section 10. The schedule shall provide detailed procedure specifications and tables or diagrams showing the procedures to be used for each required joint. Welding procedures must include filler metal, preheat, interpass temperature and stress-relief heat treatment requirements. Each welding procedure shall be clearly identified as being prequalified or required to be qualified by tests. Welding procedures must show types and locations of welds designated or in the specifications to receive nondestructive examination.
- b. Welding Process - Welding of structural steel shall be by an electric arc welding

process using a method which excludes the atmosphere from the molten metal and shall conform to the applicable provisions of AWS D1.1, Sections 1 thru 7, 9, 10 and 11. Welding shall be such as to minimize residual stresses, distortion and shrinkage.

c. Welding Technique

- (1) Filler Metal - The electrode, electrode-flux combination and grade of weld metal shall conform to the appropriate AWS specification for the base metal and welding process being used or shall be as shown where a specific choice of AWS specification allowables is required. The AWS designation of the electrodes to be used shall be included in the schedule of welding procedures. Only low hydrogen electrodes shall be used for manual shielded metal-arc welding regardless of the thickness of the steel. A controlled temperature storage oven shall be used at the job site as prescribed by AWS D1.1, Subsection 4.5 to maintain low moisture of low hydrogen electrodes.
- (2) Preheat and Interpass Temperature - Preheating shall be performed as required by AWS D1.1, Subsection 4.2 and 4.3 or as otherwise specified except that the temperature of the base metal shall be at least 20 degrees C (70 degrees F). The weldments to be preheated shall be slowly and uniformly heated by approved means to the prescribed temperature, held at that temperature until the welding is completed and then permitted to cool slowly in still air.
- (3) Stress-Relief Heat Treatment - Where stress relief heat treatment is specified or shown, it shall be in accordance with the requirements of AWS D1.1, Subsection 4.4 unless otherwise authorized or directed.

d. Workmanship - Workmanship for welding shall be in accordance with AWS D1.1, Section 3 and other applicable requirements of these specifications.

- (1) Preparation of Base Metal - Prior to welding the Contractor shall inspect surfaces to be welded to assure compliance with AWS D1.1, Subsection 3.2.
- (2) Temporary Welds - Temporary welds required for fabrication and erection shall be made under the controlled conditions prescribed for permanent work. Temporary welds shall be made using low-hydrogen welding electrodes and by welders qualified for permanent work as specified in these specifications. Preheating for temporary welds shall be as required by AWS D1.1 for permanent welds except that the minimum temperature shall be 50 degrees C (120 degrees F) in any case. In making temporary welds arcs shall not be struck in other than weld locations. Each temporary weld shall be removed and ground flush with adjacent surfaces

after serving its purpose.

- (3) Tack Welds - Tacks welds that are to be incorporated into the permanent work shall be subject to the same quality requirements as the permanent welds and shall be cleaned and thoroughly fused with permanent welds. Preheating shall be performed as specified above for temporary welds. Multiple-pass tack welds shall have cascaded ends. Defective tack welds shall be removed before permanent welding.

#### 2.2.2.2 Welding of Steel Castings

Unsound material shall be removed from the surfaces of steel castings to be incorporated into welded connections by chipping, machining, air-arc gouging or grinding. Major connections designed for transfer of stresses shall not be welded if the temperature of the casting is lower than 40 degrees C (100 degrees F). Castings containing over 0.35 percent carbon or over 0.75 percent manganese shall be preheated to a temperature not to exceed 230 degrees C (450 degrees F) and welding shall be accomplished while the castings are maintained at a temperature above 180 degrees C (350 degrees F). Welding will not be permitted on castings containing carbon in excess of 0.45 percent except on written authorization. Castings requiring welding repairs after the first annealing and castings involving welding fabrication shall be stress-relieved annealed prior to receiving final machining unless otherwise permitted.

#### 2.2.2.3 Welding of Steel Studs

The procedures for welding steel studs to structural steel, including mechanical, workmanship, technique, stud application qualification, production quality control and fabrication and verification inspection procedures shall conform to the requirements of AWS D1.1, Section 7, except as otherwise specified.

- a. Application Qualification for Steel Studs - As a condition of approval of the stud application process, the Contractor shall furnish certified test reports and certification that the studs conform to the requirements of AWS D1.1, Subsections 7.2 and 7.3, certified results of the stud manufacturer's stud base qualification test, and certified results of the stud application qualification test as required by AWS D1.1, Subsection 7.6, except as otherwise specified.
- b. Production Quality Control - Quality control for production welding of studs shall conform to the requirements of AWS D1.1, Subsection 7.7, except as otherwise specified. Studs on which pre-production testing is to be performed shall be welded in the same general position as required on production studs (flat, vertical, overhead or sloping). If the reduction of the length of studs becomes less than normal as they are welded, welding shall be stopped immediately and not resumed until the cause has been corrected.

## 2.2.3 Bolted Connections

### 2.2.3.1 Bolted Structural Steel Connections

Bolts, nuts and washers shall be of the type specified or indicated. All nuts shall be equipped with washers except for high strength bolts. Beveled washers shall be used where bearing faces have a slope of more than 1:20 with respect to a plane normal to the bolt axis. Where the use of high strength bolts is specified or indicated the materials, workmanship and installation shall conform to the applicable provisions of ASTM A 325M (ASTM A 325).

- a. Bolt Holes - Bolt holes shall be accurately located, smooth, perpendicular to the member and cylindrical.
  - (1) Holes for regular bolts shall be drilled or subdrilled and reamed in the shop and shall not be more than 2 mm (1/16 inch) larger than the diameter of the bolt.
  - (2) Holes for fitted bolts shall be match-reamed or drilled in the shop. Burrs resulting from reaming shall be removed. The threads of bolts shall be entirely outside of the holes. The body diameter of bolts shall have tolerances as recommended by ASME B4.1 for the class of fit specified. Fitted bolts shall be fitted in reamed holes by selective assembly to provide an LN-2 fit.
  - (3) Holes for high strength bolts shall have diameters of not more than 2 mm (1/16 inch) larger than bolt diameters. If the thickness of the material is not greater than the diameter of the bolts the holes may be punched. If the thickness of the material is greater than the diameter of the bolts the holes may be drilled full size or subpunched or subdrilled at least 3 mm (1/8 inch) smaller than the diameter of the bolts and then reamed to full size. Poor matching of holes will be cause for rejection. Drifting occurring during assembly shall not distort the metal or enlarge the holes. Reaming to a larger diameter of the next standard size bolt will be allowed for slight mismatching.

## 2.2.4 Castings

Each casting shall bear cast or stamped mark numbers. Castings weighing more than 225 required kilograms (500 required pounds) shall also bear cast or stamped heat numbers. Deviations from the dimensions of castings shown shall not exceed amounts that will impair the strength of castings by more than 10 percent as computed from the dimensions shown. Dimensions of castings shown on approved detail drawings shall be finished dimensions. Castings that are warped or otherwise distorted or that are oversize to an extent that will interfere with proper fit with other parts of the machinery or structure will be rejected. The structure of metal in castings shall be homogeneous and free from excessive nonmetallic inclusions.

Excessive segregation of impurities or alloys at critical points in castings will be cause for rejection. Repairs to castings shall not be made prior to approval. Minor surface imperfections not affecting the strength of casting may be welded in the "green" if approved. Surface imperfections shall be considered minor when the depth of the cavity prepared for welding is the lesser of 20 percent of the actual wall thickness or 25 mm (1 inch). Defects other than minor surface imperfections may be welded only when specifically authorized in accordance with the following requirements:

- a. The defects have been entirely removed and are judged not to affect the strength, use or machineability of the castings when properly welded and stress relieved.
- b. The proposed welding procedure, stress relief and method of examination of the repair work have been submitted and approved.

### 2.2.5 Machine Work

Tolerances, allowances and gauges for metal fits between plain, non-threaded, cylindrical parts shall conform to ASME B4.1 for the class of fit shown or required unless otherwise shown on approved detail drawings. Where fits are not shown they shall be suitable as approved. Tolerances for machine-finished surfaces designated by non-decimal dimensions shall be within 400 micrometers (1/64 inch). Sufficient machining stock shall be allowed on placing pads to ensure true surfaces of solid material. Finished contact or bearing surfaces shall be true and exact to secure full contact. Journal surfaces shall be polished and all surfaces shall be finished with sufficient smoothness and accuracy to ensure proper operation when assembled. Parts entering any machine shall be accurately machined and all like parts shall be interchangeable except that parts assembled together for drilling or reaming of holes or machining will not be required to be interchangeable with like parts. All drilled holes bolts shall be accurately located.

#### 2.2.5.1 Finished Surfaces

Surface finishes indicated or specified shall be in accordance with ASME B46.1. Values of required roughness heights are arithmetical average deviations expressed in micrometers (microinches). These values are maximum. Lesser degrees will be satisfactory unless otherwise indicated. Compliance with surface requirements shall be determined by sense of feel and visual inspection of the work compared to Roughness Comparison Specimens in accordance with the provisions of ASME B46.1. Values of roughness width and waviness height shall be consistent with the general type of finish specified by roughness height. Where the finish is not indicated or specified it shall be that which is most suitable for the particular surface, provide the class of fit required and be indicated on the detail drawings by a symbol which conforms to ASME B46.1 when machine finishing is provided. Flaws such as scratches, ridges, holes, peaks, cracks or checks which will make the part unsuitable for the intended use will be cause for rejection.

#### 2.2.5.2 Unfinished Surfaces

All work shall be laid out to secure proper matching of adjoining unfinished surfaces unless otherwise directed. Where there is a large discrepancy between adjoining unfinished surfaces they shall be chipped and ground smooth or machined to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the parts shall be filled in an approved manner.

#### 2.2.5.3 Pin Holes

Pinholes shall be bored true to gauges, smooth, straight and at right angles to the axis of the member. The boring shall be done after the member is securely fastened in position.

#### 2.2.5.4 Shafting

All shafting shall be turned or ground hot-rolled or cold-rolled steel as required unless otherwise specified or authorized. Fillets shall be provided where changes in section occur. Cold-finished shafting may be used where keyseating is the only machine work required.

#### 2.2.5.5 Bearings

Bearings may be lined with babbitt or bronze unless otherwise specified or shown. Where the bearing pressure is in excess of 1400 kpa (200 psi), bearings shall be lined with bronze. Anti-friction bearings of approved types and of sizes not less than those recommended by the bearing manufacturer for the duty intended will be permitted subject to approval. All bearings shall be properly aligned and provided with a suitable means of lubrication. Anti-friction bearings shall be so installed as to provide for retention of the lubricant and to exclude dirt and grit.

### 2.2.6 Miscellaneous Provisions

#### 2.2.6.1 Metallic Coatings

Zinc Coatings - Zinc coatings shall be applied in a manner and of a thickness and quality conforming to ASTM A 123. Where zinc coatings are destroyed by cutting, welding or other causes the affected areas shall be regalvanized. Coatings 50 g (2 ounces) or heavier shall be regalvanized with a suitable low-melting zinc base alloy similar to the recommendations of the American Hot-Dip Galvanizers Association to the thickness and quality specified for the original zinc coating. Coatings less than 50 g (2 ounces) shall be repaired in accordance with ASTM A 780.

#### 2.2.6.2 Cleaning of Corrosion-Resisting Steel

Oil, paint and other foreign substances shall be removed from corrosion-resisting steel surfaces after fabrication. Cleaning shall be done by vapor degreasing or by the use of cleaners of the alkaline, emulsion or solvent type. After the surfaces have been cleaned they shall be given a

final rinsing with clean water followed by a 24 hour period during which the surfaces are intermittently wet with clean water and then allowed to dry for the purpose of inspecting the clean surfaces. The surfaces shall be visually inspected for evidence of paint, oil, grease, welding slag, heat treatment scale, iron rust or other forms of contamination. If evidence of foreign substance exist the surface shall be cleaned in accordance with the applicable provisions of ASTM A 380. The proposed method of treatment shall be furnished for approval. After treatment the surfaces shall be visually reinspected. Brushes used to remove foreign substances shall have only stainless steel or nonmetallic bristles. Any contamination occurring subsequent to the initial cleaning shall be removed by one or more of the methods indicated above.

#### 2.2.6.3 Lubrication

The arrangement and details for lubrication shall be as shown. Before erection or assembly all bearing surfaces shall be thoroughly cleaned and lubricated with an approved lubricant.

#### 2.2.7 Shop Assembly

Each machinery and structural unit furnished shall be assembled in the shop to determine the correctness of the fabrication and matching of the component parts unless otherwise specified. Tolerances shall not exceed those shown. Each unit assembled shall be closely checked to ensure that all necessary clearances have been provided and that binding does not occur in any moving part. Assembly in the shop shall be in the same position as final installation in the field unless otherwise specified. Assembly and disassembly work shall be performed in the presence of the Contracting Officer unless waived in writing. Errors or defects disclosed shall be immediately remedied by the Contractor without cost to the Government. Before disassembly for shipment each piece of a machinery or structural unit shall be match-marked to facilitate erection in the field. The location of match-marks shall be indicated by circling with a ring of white paint after the shop coat of paint has been applied or as otherwise directed.

### 2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

The Contractor shall have required material tests and analyses performed and certified by an approved laboratory to demonstrate that materials are in conformity with the specifications. These tests and analyses shall be performed and certified at the Contractor's expense. Tests, inspections, and verifications shall conform to the requirements of the particular sections of these specifications for the respective items of work unless otherwise specified or authorized. Tests shall be conducted in the presence of the Contracting Officer if so required. The Contractor shall furnish specimens and samples for additional independent tests and analyses upon request by the Contracting Officer. Specimens and samples shall be properly labeled and prepared for shipment.

### 2.3.1 Nondestructive Testing

The Contractor shall perform quality control testing to ensure sound welds. When doubt exists as to the soundness of any material part such part may be subjected to additional nondestructive testing as determined by the Contracting Officer. This may include ultrasonic, magnaflux, dye penetrant, x-ray, gamma ray or any other test that will thoroughly investigate the part in question. The cost of such investigation will be borne by the Government unless defects are found. Any defects will be cause for rejection and rejected parts shall be replaced and retested at the Contractor's expense.

### 2.3.2 Tests of Machinery and Structural Units

The details for tests of machinery and structural units shall conform to the requirements of the particular sections of these specifications covering these items. Each complete machinery and structural unit shall be assembled and tested in the shop in the presence of the Contracting Officer unless otherwise directed. Waiving of tests will not relieve the Contractor of responsibility for any fault in operation, workmanship or material that occurs before the completion of the contract or guarantee. After being installed at the site each complete machinery or structural unit shall be operated through a sufficient number of complete cycles to demonstrate to the satisfaction of the Contracting Officer that it meets the specified operational requirements in all respects.

### 2.3.3 Inspection of Structural Steel Welding

Welding shall be subject to inspection to determine conformance with the requirements of AWS D1.1, the approved welding procedures and provisions stated in other sections of these specifications. Nondestructive examination of designated welds will be required. Supplemental examination of any joint or coupon cut from any location in any joint may be required.

#### 2.3.3.1 Visual Examination

All visual examination of completed welds shall be cleaned and carefully examined for insufficient throat or leg sizes, cracks, undercutting, overlap, excessive convexity or reinforcement and other surface defects to ensure compliance with the requirements of AWS D1.1, Section 3 and Section 9, Part D.

#### 2.3.3.2 Test Coupons

The Government reserves the right to require the Contractor to remove coupons from completed work when doubt as to soundness cannot be resolved by nondestructive examination. Should tests of any two coupons cut from the work of any welder show strengths less than that specified for the base metal it will be considered evidence of negligence or incompetence and such welder shall be removed from the work. When coupons are removed from any part of a structure the members cut shall be repaired in a neat manner with joints of the proper type to develop the full strength of the members. Repaired joints shall be peened as approved or directed to relieve

residual stress. The expense for removing and testing coupons, repairing cut members and the nondestructive examination of repairs shall be borne by the Contractor.

#### 2.3.3.3 Supplemental Examination

When the soundness of any weld is suspected of being deficient due to faulty welding or stresses that might occur during shipment or erection the Government reserves the right to perform nondestructive supplemental examinations before final acceptance. The cost of such inspection will be borne by the Government.

#### 2.3.4 Structural Steel Welding Repairs

Defective welds in the structural steel welding repairs shall be repaired in accordance with AWS D1.1, Subsection 3.7. Defective weld metal shall be removed to sound metal by use of air carbon-arc or oxygen gouging. Oxygen gouging shall not be used on ASTM A 514/A 514M steel. The surfaces shall be thoroughly cleaned before welding. Welds that have been repaired shall be retested by the same methods used in the original inspection. Except for the repair of members cut to remove test coupons and found to have acceptable welds costs of repairs and retesting shall be borne by the Contractor.

#### 2.3.5 Inspection and Testing of Steel Stud Welding

Fabrication and verification inspection and testing of steel stud welding shall conform to the requirements of AWS D1.1, Subsection 7.8 except as otherwise specified. The Contracting Officer will serve as the verification inspector. One stud in every 100 and studs that do not show a full 360 degree weld flash, have been repaired by welding or whose reduction in length due to welding is less than normal shall be bent or torque tested as required by AWS D1.1, Subsection 7.8. If any of these studs fail two additional studs shall be bent or torque tested. If either of the two additional studs fail all of the studs represented by the tests shall be rejected. Studs that crack under testing in either the weld, base metal or shank shall be rejected and replaced by the Contractor at no additional cost.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

All parts to be installed shall be thoroughly cleaned. Packing compounds, rust, dirt, grit and other foreign matter shall be removed. Holes and grooves for lubrication shall be cleaned. Enclosed chambers or passages shall be examined to make sure that they are free from damaging materials. Where units or items are shipped as assemblies they will be inspected prior to installation. Disassembly, cleaning and lubrication will not be required except where necessary to place the assembly in a clean and properly lubricated condition. Pipe wrenches, cold chisels or other tools likely to cause damage to the surfaces of rods, nuts or other parts shall not be used for assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly

but care shall be taken not to overstress the threads. When a half nut is used for locking a full nut the half nut shall be placed first and followed by the full nut. Threads of all bolts except high strength bolts, nuts and screws shall be lubricated with an approved lubricant before assembly. Threads of corrosion-resisting steel bolts and nuts shall be coated with an approved antigalling compound. Driving and drifting bolts or keys will not be permitted.

### 3.1.1 Alignment and Setting

Each machinery or structural unit shall be accurately aligned by the use of steel shims or other approved methods so that no binding in any moving parts or distortion of any member occurs before it is fastened in place. The alignment of all parts with respect to each other shall be true within the respective tolerances required. Machines shall be set true to the elevations shown.

### 3.1.2 Blocking and Wedges

All blocking and wedges used during installation for the support of parts to be grouted in foundations shall be removed before final grouting unless otherwise directed. Blocking and wedges left in the foundations with approval shall be of steel or iron.

## 3.2 PROTECTION OF FINISHED WORK

### 3.2.1 Machined Surfaces

Machined surfaces shall be thoroughly cleaned of foreign matter. All finished surfaces shall be protected by suitable means. Unassembled pins and bolts shall be oiled and wrapped with moisture resistant paper or protected by other approved means. Finished surfaces of ferrous metals to be in bolted contact shall be washed with an approved rust inhibitor and coated with an approved rust resisting compound for temporary protection during fabrication, shipping and storage periods.

### 3.2.2 Lubrication After Assembly

After assembly all lubricating systems shall be filled with the lubricant specified and additional lubricant shall be applied at intervals as required to maintain the equipment in satisfactory condition until acceptance of the work.

--End of Section--

DIVISION 5 – METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05120

STRUCTURAL STEEL

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DIVISION 5 – METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all shop drawings, plant, labor, materials, and equipment, and installing all structural steel items in the pumping station superstructure as specified herein and/or as shown on the drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

- (1) Materials

Suitability for use in the work, adherence to specification standards, timely submission of certifications.

- (2) Shop Drawings and Submittals

Review of all submittals for accuracy prior to submission.

A copy of these records and tests, as well as the records of corrective action taken, will be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC), Publication.

Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, with Commentary, Ninth Edition.  
(Revised OCT 75)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATIONS.

A 36/A36M-96 Carbon Structural Steel

A 307-94 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

F 844-90 Washers, Steel, Plain (Flat), Unhardened for General Use

AMERICAN WELDING SOCIETY (AWS), PUBLICATION.

D1.1-94 Structural Welding Code – Steel

#### 1.4 GENERAL

The AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings shall govern the work. Substitution of sections or modification of connection details will not be accepted unless approved by the Contracting Officer. Welding shall be in accordance with AWS D1.1.

##### 1.4.1 Shop Drawings

Shop drawings shall be submitted for approval in accordance with Section 00800, paragraph 1.16. Drawings shall include all shop and erection details, and members and connections for any portion of the structure not shown on the contract drawings shall be detailed by the fabricator and indicated on the shop drawings. All welds shall be indicated by standard welding symbols of the AWS.

##### 1.4.2 Certification

Certified copies of mill test reports including names and locations of mills and shops, shall be furnished for all structural steel in accordance with Section 00800, paragraph 1.32.

##### 1.4.3 Qualification of Welders

Certification that each welder is qualified in accordance with AWS Code D1.1 shall be provided. Any welder shall be retested and recertified when the work of the welder creates a reasonable doubt as to his proficiency. Tests, when required, shall be conducted at no additional expense to the Government. Recertification of the welder shall be submitted only after the welder has taken and passed the required retest.

##### 1.4.4 Storage of Materials

Material shall be stored out of contact with the ground in such manner and location as will minimize contamination and deterioration.

## PART 2 PRODUCTS

### 2.1 MATERIALS

The materials shall conform to the respective specifications and other requirements specified below.

#### 2.1.1 Structural Steel

ASTM Specification A 36/A36M

### 2.1.2 Bolts and Nuts

ASTM Specification A 307, grade A

### 2.1.3 Plain Washers

Plain washers shall conform to ASTM F 844

## PART 3 EXECUTION

### 3.1 FABRICATION

Structural steelwork material shall be fabricated in accordance with the applicable provisions of the AISC Specifications. Fabrication and assembly shall be done in the shop to the greatest extent possible. Structural steelwork, except surfaces to be field welded shall be prepared for painting and primed with paint materials as specified in SECTION 09900 – PAINTING - GENERAL.

### 3.2 ERECTION

The erection of structural steel shall be in accordance with the applicable provisions of the AISC Specification.

#### 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 as shown on the drawings.

#### 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 as shown on the drawings. Base plates and bearing plates shall be provided with full bearing after the supported members have been plumbed and properly positioned. The area under the plate shall be grouted as necessary with a non-shrink grout similar and equal to “Embeco-636” as manufactured by Master Builder Co., Cleveland, Ohio.

-- End of Section --

DIVISION 5 – METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05210

STEEL JOISTS

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DIVISION 5 – METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05210

STEEL JOISTS

PART 1 GENERAL

1.1 APPLICABLE PUBLICATION

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

STEEL JOIST INSTITUTE (SJI)

SJI-01 (1988) 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 01330.

SD-04 Drawings

Steel Joists; FIO.

Detail drawings shall include fabrication and erection details, specifications for shop painting, and identification markings of joists.

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 and conform to SJI-01. 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.

## 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 LOFT DECK

The deck of the loft over the office shall be constructed as shown on the drawings. The Contractor may use design mix as used for the pumping station or may use grout mix as specified in SECTION 04200 paragraph 1.4.6 Grout.

-- End of Section --

DIVISION 5 – METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05305

SIDING AND ROOFING, STEEL AND LOFT ROOF SYSTEM

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DIVISION 5 – METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05305

SIDING AND ROOFING, STEEL AND LOFT ROOF SYSTEM

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all shop drawings, plant, labor, materials and equipment, and performing all operations in connection with the installation of the steel roof decking and wall panel system as specified herein and/or shown on the drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Material

Suitability for use in the work, adherence to specification standards, section properties, working stress loads, review of certifications and shop drawings with design computations prior to submittals, accessories.

(2) Installation

Condition of material, storage, test welds, supports, joints and laps, fastening of deck units, wall panels and touch-up painting.

A copy of these records and test, as well as the records of corrective action taken, will be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM).

ASTM A 82-95a	Steel Wire, Plain, for Concrete Reinforcement
ASTM A 185-94	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
A 653/A 653M-96	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process

## AMERICAN IRON AND STEEL INSTITUTE (AISI).

Specification for the Design of Cold-Formed Steel Structural Members (1968) (Revised thru 1971).

## PART 2 PRODUCTS (NOT APPLICABLE)

## PART 3 EXECUTION

## 3.1 DESIGN AND FABRICATION

## 3.1.1 Decking Design Requirements

Decking units shall be constructed of rib sections providing a satisfactory surface of the reception of insulation or underlayment. Wherever practicable, units shall be of sufficient length to span two or more supports. Decking units shall be designed to provide the minimum section properties shown. Section properties shall be determined in accordance with the AISI Specification for the Design of Cold-Formed Steel Structural Members. The maximum working stress shall not exceed 20,000 pounds per square inch. Unless otherwise shown, there will be no loads suspended from the decking, and design shall be without consideration of such loadings.

## 3.1.2 Wall Panel System Design Requirements

Panels shall have configurations for overlapping adjacent sheets or interlocking ribs for securing adjacent sheets. Width of sheets with overlapping configurations shall provide not less than 24 inches of coverage in place; width of sheets with interlocking ribs shall provide not less than 12 inches of coverage in place. Lengths of sheets shall be sufficient to cover the entire length of any unbroken wall surface when such wall height is 30 feet or less. Sheets shall be either square-cut or miter-cut except gable and wall sheets may be cut in the shop to correspond to the roof slope and shall have a horizontal joint at the eave line. Colors will be selected from color samples submitted to the Contracting Officer and shall match the existing pumping station color. The exterior side of the wall panels shall be factory painted the color as selected.

## 3.1.3 Decking Units

The decking units shall be fabricated of 22 Galvanized Sheet Gage or thicker steel sheets conforming to ASTM A 653/A 653M and A 924/A 924M.

## 3.1.4 Wall Panel

The wall panels shall be fabricated of 24 Galvanized Sheet Gage or thicker steel sheets conforming to ASTM A 653/A 653M and A 924/A 924M.

### 3.1.5 Accessories

#### 3.1.5.1 Decking Accessories

Any accessories shall be furnished as necessary to complete the roof deck installation, including the roof ventilator specified in SECTION 15653 - POWER ROOF VENTILATOR, paragraph 2.4. The use of welding washers is optional; and unless otherwise shown, premolded neoprene closures may be used in lieu of sheet metal closures. Finish of accessories shall be the same as the finish of the roof decking units. Minimum gages and Galvanized Sheet Gage for zinc-coated sheets, shall be as follows: saddles, 18 gage; closures, 22 gage; valley plates, 20 gage; and welding washers, 16 gage.

#### 3.1.5.2 Panel Accessories

The wall panel accessories shall be as standard with the manufacturer unless otherwise noted on the drawings and/or specifications.

### 3.2 SHOP DRAWINGS

All shop drawings shall be submitted for approval in accordance with Section 00800, paragraph 1.16. Shop drawings shall include layout of the work, dimensions and details of decking units, wall panels and accessories, materials of construction, and erection instructions. Details and layouts shall show location of supporting members, quantity and marking of decking units, size and location of holes to be cut, and the location, type, and sequence of welded connections. Shop drawings shall be accompanied by design computations for the structural properties of the decking units.

### 3.3 DELIVERY AND STORAGE

Materials shall be delivered to the site in a dry and undamaged condition, stored out of contact with the ground and under a weather-tight covering permitting good air circulation. Finish of decking units and wall panels shall be maintained at all times, using touch-up paint whenever necessary to prevent the formation of rust. Touch-up paint for zinc-coated units shall be approved high zinc dust content, galvanizing repair paint.

### 3.4 QUALIFICATION OF WELDERS AND EQUIPMENT

Prior to installation of any steel decking units, the welders shall, under simulated field conditions, demonstrate satisfactory ability to weld the decking units to be used. In this demonstration, the materials, equipment, and procedures must also prove satisfactory before they are used in the actual installation. After adjustment of the equipment, by experimental welding, each welder shall make five test welds of each type to be used on the job. In order to qualify for work on the job 1/2-inch diameter test welds shall show minimum 3/8-inch diameter buttons when sheared from supports, and all test welds shall be free of cracks, craters, and other defects.

### 3.5 ERECTION

Erection of the decking and wall panels shall be in accordance with the approved shop drawings and the requirements herein. Decking units and wall panels shall be handled in a manner to avoid damaging the units. Use of the installed roof decking as a storage space or as a working platform will be permitted only after the portion desired for use has been secured in place. Temporary loads on the roof decking shall be limited so that over-loading will not occur. Decking units and wall panels shall be applied only over supports which have been accurately aligned and secured in position. Joints and laps shall be made without stretching and shall be watertight. End laps of decking shall be two inches or more and shall be made over supports. Fastening of decking units to supports shall be by electric arc welding. The ambient temperature when the welding is performed shall be 35 degrees F. or

higher. Attachment of the wall panels to the girts shall be by self-tapping screws. The screws shall be not less than No. 14 diameter. Ribbed decking units having rib width at top opening and at bottom surface of 1/2 inch or greater shall be top welded using 1/2-inch diameter puddle welds with maximum spacing as follows:

- (1) End laps and ends terminating at supports: 12 inches on center or equivalent number of welds for rib spacing other than 6 inches.
- (2) Side laps and sides: At each support and intermediately at 5 feet on center, except mechanical fasteners may be used for the intermediate fastening.
- (3) Remainder of panel: 18 inches on center at supports or equivalent number of welds for rib spacings other than 6 inches. Decking units other than the configuration for which the weld spacing is specified above shall be welded using weld types and spacings that will develop strength equal to the weld types and spacings specified for the units with a rib width of 1/2 inch or greater. Ribbed decking units having a rib width of less than 1/2 inch shall be welded from the side or bottom in lieu of being top welded. Metal accessories shall be securely welded in place. Welds shall be free of cracks, craters, and other defects. Units with burned holes or any other damage shall be replaced with satisfactory units. Unless otherwise shown, penetrations of the decking for the attachment or suspension of other items shall not be made. Openings shall be cut into steel deck at the locations shown or otherwise required to accommodate other work and shall be made in a manner that will not adversely affect the structural properties of the deck or the finished appearance of exposed surfaces. Areas scarred during erection and all welds shall be thoroughly cleaner and touched-up with a paint as recommended by the manufacturer.

## 3.6 LOFT ROOF SYSTEM

### 3.6.1 Details

Details shall be as shown on the drawings and as specified herein below.

### 3.6.2 Concrete

Concrete shall conform to the concrete as specified in SECTION 03301.

### 3.6.3 Steel Forms

Design of steel forms shall conform to AISI-01. Units shall be designed for attachment to the structural supports by welding or as shown on the drawings.

### 3.6.4 Shop Drawings

All shop drawings shall be submitted for approval in accordance with Section 00800, paragraph 1.16. Shop drawings shall include layout of the work, dimensions and details of items used to fabricate the forms, materials of construction, and erection instructions. Details and layouts shall show location of supporting members, type, and sequence of welded connections.

### 3.6.5 Formwork

Forms shall be attached to structural members as shown on the shop drawings. Sheets shall be placed with edge-corrugation lips pointing upward and shall be lapped not less than one full corrugation. End laps shall be located over permanent supports and shall be a minimum of 2 inches. Prior to placing concrete, areas of coating that have been damaged by welding or other operations shall have welding flux, spatter, and slag removed, shall be cleaned of loose rust and other foreign matter by wire brushing, and then coated with zinc-rich paint.

### 3.6.6 Wire Reinforcement

Wire reinforcement shall be unrolled and placed so that the long dimension is perpendicular with the corrugation in the steel forms. Location of reinforcement shall be approximately in the center of lower one-third of the slab in which it is placed; however, minimum cover for reinforcement shall be  $\frac{3}{4}$  inch.

### 3.6.7 Concrete Conveying and Placement

Conveying of concrete from the mixer to place of deposit shall be by methods that will prevent segregation and loss of material. Equipment for conveying concrete shall be of such size and design to ensure uniform, continuous placement of concrete. Concrete shall be deposited and screeded in a continuous operation until the placing of the lift concrete pour is complete. Rodding, tamping, vibrating, or steel troweling shall not be used. Temporary runways may be used during placement.

### 3.6.8 Hot-Weather and Cold-Weather Requirements

Hot-weather and cold-weather requirements shall be as specified in SECTION 03301 paragraph 1.6.3.

### 3.6.9 Curing

Curing shall be as recommended by the Contracting Officer.

--End of Section--

DIVISION 5 – METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05505

MISCELLANEOUS FEATURES

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DIVISION 5 – METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05505

MISCELLANEOUS FEATURES

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all shop drawings, plants, labor, materials, and equipment, and installing all structural steel miscellaneous items in the pumping station as specified herein and/or as shown on the drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Materials

Suitability for use in the work, adherence to specification standards, timely submission of certifications.

(2) Fabrication

Adherence to applicable specification standards; shapes, dimensions and assembly in conformance with approved shop drawings or brochures, timely submission of item listings with governing codes.

(3) Installation

Coatings, handling, positioning, alignment, elevations, anchoring, painting, adjustments, hoist capacity, clearances.

(4) Shop Drawings and Submittals

Review of all submittals for accuracy prior to submission.

A copy of these records and tests, as well as the records of corrective action taken, will be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, with Commentary, Ninth Edition.

AMERICAN WELDING SOCIETY (AWS)

D1.1-94 Structural Welding Code Steel Thirteenth Edition

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 36/A36 M-96 Carbon Structural Steel

A 53-96 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

A 307-94 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

PORCELAIN ENAMEL INSTITUTE STANDARDS

PEI: CG-1 Color Guide for Architectural Porcelain Enamel

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 FABRICATION

Structural steelwork material, including miscellaneous metal items not covered by nationally recognized codes, shall be fabricated in accordance with the applicable provisions of the AISC Specification. The miscellaneous items, which are fabricated under national codes other than AISC Specifications, shall be listed and a list of those items along with the governing codes shall be furnished to the Contracting Officer in accordance with the requirements pertaining to Shop Drawings. All fabrication and assembly shall be done in the shop to the greatest extent possible. Structural steelwork, except surfaces to be field welded shall be prepared for painting and primed with paint materials as specified in SECTION 09900 PAINTING – GENERAL.

3.2 SHOP DRAWINGS

The Contractor shall prepare and submit to the Contracting Officer for approval shop drawings for all metalwork and structural steel requiring fabrication. Where materials are standard, data including specifications and descriptions shall be submitted. All welds shall be indicated by standard welding symbols of the AWS. Shop drawings and data shall be submitted in accordance with the requirements of Section 00800, paragraph 1.16.

3.3 QUALIFICATIONS OF WELDERS

Certification that each welder is qualified in accordance with AWS Code D1.1 shall be provided. Any welder shall be retested and recertified when the work of the welder creates a reasonable doubt as to his proficiency. Tests, when required, shall be conducted at no additional expense to the Government. Recertification of the welder shall be submitted only after the welder has taken and passed the required retest.

### 3.4 STORAGE OF MATERIALS

Material shall be stored out of contact with the ground in such manner and location as will minimize contamination and deterioration.

### 3.5 STRUCTURAL STEEL SHAPES AND MEMBERS

#### 3.5.1 General

Prior to incorporation of any structural steel in the work, the Contractor shall furnish without extra cost to the Government, three certified copies of all mill reports covering the chemical and physical properties of all steel used in the work. The Government reserves the right to inspect and test the structural steel in the mill, shop and/or field. Such inspection and/or test will be conducted without expense to the Contractor; however, inspections and/or tests in the mill or shop shall not relieve the Contractor of this responsibility to furnish materials specified. Substitution of sections and/or modifications of details shall be made only when approved by the Contracting Officer.

#### 3.5.2 Installation

The installation of structural steel members shall be at the locations indicated on the drawings and in accordance with the details shown.

### 3.6 HANDRAILS

The Contractor shall furnish and install handrails at the locations as shown on the drawings. The handrails and posts shall be fabricated of pipe conforming to ASTM A 53, Type S, Grade A, Schedule 40 for rails and Schedule 80 for posts. The handrails and posts shall be of welded construction and hot dipped galvanized after fabrication. The size of the rails and posts shall be as shown on the drawings and they shall be erected to proper line and grade and attached in the manner and at the locations shown on the drawings.

### 3.7 LADDERS

The Contractor shall furnish and install ladders which shall be anchored to the walls of the manholes with anchor bolts as shown on the drawings. The ladders and accessories shall be of galvanized steel and fabricated to the sizes and shapes as indicated therefor on the drawings. Fabrication shall be in accordance with the applicable provisions of SECTION 05101-METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS. The Contractor may provide ladders of standard manufacture provided such ladders meet the requirements for their intended use.

### 3.8 EXHAUST SILENCER WIND BRACES AND SUPPORTS

The Contractor shall furnish and install wind braces and supports for each of the exhaust silencers as supplied by the manufacturer at the locations as shown on the drawings. The sizes, shapes, and anchorages shall be as recommended by the manufacturer. The wind braces and supports shall be fabricated of structural steel members conforming to the requirements of ASTM A 36/A 36M. The anchorages shall conform to ASTM A 307, for Grade A Bolts. The wind braces and supports shall be hot-dipped galvanized after fabrication.

### 3.9 STAIRS

The Contractor shall furnish and install stairs which shall be attached to the gatehoist platform and concrete pad in the manner and at the location shown on the drawings and shall also furnish and install stairs from the office to the equipment room, as shown on the drawings. The stairs shall be of welded and/or bolted construction either as shown on the drawings or required for the fabrication of the stairs. The stairs shall be of the open riser type. The stair treads shall be fabricated of open smooth gratings with closed abrasive nosings. Handrails for the stairs shall be as specified in 3.6 above. The structural steel stairs and appurtenances shall be galvanized after fabrication. Fabrication shall be in accordance with the applicable provisions of SECTION 05101 – METAL WORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS.

### 3.10 TRASH RACKS

The Contractor shall furnish and install trash racks for the intake structure as shown on the drawings. The trash racks shall be fabricated of structural steel with welded joints. The size and shape of the individual rack, including bar sizes and eyebolt sizes, shall be as shown on the drawings. The trash racks shall be hot-dipped galvanized after fabrication.

### 3.11 STEEL PLATFORM

The Contractor shall furnish and install a steel platform with handrails and supports to be attached to the pumping station structure as shown on the drawings. The steel platform with handrails and supports shall be fabricated of structural steel with welded joints and bolts as shown on the drawings. The size and shape of the steel platform, including bar sizes, shall be as shown on the drawings. The steel platform, handrail, and supports shall be hot-dipped galvanized after fabrication.

### 3.12 PROTECTION ANGLES

The steel for the protection angles shall conform to the requirements of ASTM A 36/A 36 M. The anchors shall be of type, size, and length as called for on the drawings. The anchors shall be welded to the structural members. The structural members shall be of the sizes and shapes as shown and shall be hot-dipped galvanized after fabrication. The protection angles shall be furnished and installed as shown.

### 3.13 HAND RAKING EQUIPMENT

Two hand rakes for cleaning the trash racks shall be furnished with the racks. The rakes shall be constructed of stainless steel heads and hollow aluminum handles made buoyant by sealing or foam packed. The rake heads shall be 15 inches wide with teeth and guards so spaced to mesh with the trash rack bars. Rake handles shall be 27 feet in length. The diameter of the rake handles is 1¼".

### 3.14 MANHOLE FRAMES AND COVERS

There shall be manhole frames and covers installed on the four manholes. The frames and covers shall be Neenah R-6663 MH with "T" hinges. All covers shall have Type G lift handle as manufactured by Neenah Foundry Company, Neenah, Wisconsin, or an approved equal.

### 3.15 WATERPROOF HATCH

There shall be a waterproof hatch installed at the waterproof hatch opening. The Contractor shall submit catalogue cuts showing dimensions, shape, and materials, and how it is waterproofed and installed in the opening; to the Contracting Officer for approval.

### 3.16 STAGE GAGE

A stage gage shall be installed at the location shown on the drawings. The gage shall be constructed of 18-gauge steel plate in approximately 5-foot long sections. Splices shall be located at the three-quarter foot mark where possible. The over-all length of the gage shall be as shown on the drawings. The gage shall be porcelain enameled and graduated in feet and tenths of feet. The porcelain enamel shall be applied by the wet process and thoroughly fused to the metal at or above red heat. Enamel shall be smooth, glossy, free from craze, chips, or other flaws. The gage shall be mounted on the wall with expansion shields and bronze round head machine screws and lead washers. All cutting and drilling on parts to be enameled shall be done prior to enameling. The background of all surfaces of the gage shall be given one black coat of enamel after which the indicating face shall be given one black coat and then two orange-yellow coats with all numerals and gagemarks brushed free of the orange-yellow coating. The colors of the enamel shall conform to the Porcelain Enamel Institute color designations PEI-28 for black and PEI-8 for the orange-yellow. The gage shall be set to conform to the elevations shown on the drawings. The top of the stage gage shall have a clearly marked reference elevation.

### 3.17 PAINTING

Painting of nongalvanized items, shall be as specified in SECTION 09900 – PAINTING - GENERAL. Galvanized surfaces, which, during handling or erection, have been damaged shall be repaired by coating the damaged surface with a heavy coat of a high-zinc content galvanizing compound.

--End of Section--

DIVISION 5 – METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05510

GUARD RAIL

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DIVISION 5 – METALS: STRUCTURAL AND MISCELLANEOUS

SECTION 05510

GUARD RAIL

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, materials, and equipment, and installing all structural steel items for the guardrail as specified herein and/or indicated on the drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

- (1) Materials  
Conform to the specifications.
- (2) Installation  
Conforms to the specifications.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

A 36/A36M-96	Carbon Structural Steel
A 123/-89a and Ed. Cmt 1	Zinc (Hot-Dip Galvanized) on Iron and Steel Hardware
A 153/A153M-95	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A 307-94	Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

AMERICAN ASSOCIATION OF STATE HIGHWAY BRIDGES AND TRANSPORTATION OFFICIALS (AASHTO).

Standard Specifications for Highway Bridges, Fifteenth Edition, 1992

M 180-89

Corrugated Sheet Steel Beams for Highway Guardrail

MISSOURI STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (1993 EDITION).

#### 1.4 STORAGE OF MATERIALS

Material shall be stored at the bridge site above the ground upon platforms, skids, or other supports. It shall be kept free from dirt, grease, and other foreign matter, and shall be protected as far as practicable from corrosion.

### PART 2 PRODUCTS

#### 2.1 GUARD RAIL

##### 2.1.1 Structural Steel

All structural steel shall conform to the requirements of ASTM A 36/A36 M.

##### 2.1.2 Bolts, Nuts, and Washers

All bolts, nuts, and washers exclusive of U-bolts shall conform to the requirements of ASTM A 307, Type 1 and shall be galvanized in accordance with ASTM A 153. All "U"-bolts shall conform to ASTM A 36.

##### 2.1.3 Bridge Guard Rails and Posts, and Mounting Plates with Studs

The posts, plates, channels, W rails, splice plates, mounting plates with studs, and terminal sections of the guardrails shall be galvanized steel and structural shapes as indicated on the drawings. Steel for the post, plate, splice plate, and channel members shall meet the requirements of ASTM A 36 and shall be galvanized in accordance with ASTM A 123. The galvanized W rail sections including bolts shall conform to the requirements of AASHTO M 180, Class B, Type 1. The reflective washers for bridge guardrail shall be furnished by the Contractor. The Contractor shall submit a sample reflective washer that he intends to use, to the Contracting Officer for approval.

##### 2.1.4 Certificates

Certificates of compliance will be required for all materials.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

The guardrail shall be installed as indicated on the drawings and/or as specified herein and in Section 1040 of the Missouri Standard Specifications for Highway Construction.

--End of Section--

Invitation No. DACW66-99-B-0014

DIVISION 6 - WOOD AND PLASTIC

(NOT USED)

DIVISION 7 - THERMAL & MOISTURE PROTECTION

SECTION 07510

BUILT-UP ROOFING

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DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07510

BUILT-UP ROOFING

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, material and equipment, and performing all operations in connection with constructing the built-up roof, including the insulation, felt, asphalt, and surfacing materials, all as specified herein and/or indicated on the drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Materials

Suitability for use in the work, adherence to specification standards, storage of felt rolls (including time and temperature requirements), review of certifications for compliance prior to submittal.

(2) Installation

Preparatory work (including cleanliness, smoothness, firmness), sequence of operations, application of primer, asphalt coat, insulation, minimum quantities for roofing, laps, starting widths, fastening, asphalt temperature, bitumen coverage, mopping-in, flashing installation, application at eaves, flood coat, surfacing.

(3) Sampling

Accuracy of cut, timeliness of replacement, laps and courses of cover patch.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

### 1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

C 208-95	Cellulosic Fiber Insulation Board
D 41-94	Used in Roofing, Asphalt Primer Dampproofing, and Waterproofing
D 312-95a	Asphalt Used in Roofing
D 1863-93 (R 1996)	Mineral Aggregate Used on Built-up Roofs
D 2178-97	Asphalt Glass Felt Used in Roofing and Waterproofing
D 4586-93	Asphalt Roof Cement, Asbestos Free
D 4601-97	Asphalt-Coated Glass Fiber Base Sheet Used in Roofing

#### AMERICAN WOOD PRESERVERS' ASSOCIATION (AWPA)

AWPA P5-96	Standard for Water Borne Preservations
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#### FEDERAL SPECIFICATIONS (FED. SPEC.)

MM-L-751H	Lumber, Softwood
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### 1.4 GENERAL

Asphalt built-up roofing shall be applied to the roof surfaces indicated.

#### 1.4.1 Storage of Materials

Felts and roll roofing shall not be exposed to any moisture before, during, or after delivery to the site. Felts and roll roofing shall be stored in an enclosed building or in a trailer, stacked on end, and maintained above 50°F for 24 hours immediately before laying. Aggregate shall be maintained surface dry as defined by ASTM D 1863.

#### 1.4.2 Coordination Requirements

Roofing operations shall be coordinated with sheet metalwork so that flashings are installed to permit continuous roof surfacing operations the

same day felts are installed. Roofing operations shall also be coordinated with roof insulation work so that all insulation applied each day is waterproofed the same day with the complete roofing system.

#### 1.4.3 Preparation Requirements

The entire roof-deck construction of any bay or section of the building shall be completed before roofing work is begun thereon. Vents and other items penetrating the roof shall be secured in position and properly prepared for flashing.

#### 1.4.4 Applications Requirements

Surfaces shall be inspected and approved immediately prior to application of roofing and flashings. The roofing or flashing shall be applied to a smooth and firm surface free from ice, frost, moisture, dirt, projections, foreign materials. Application of roofing shall not be performed under damp or wet conditions, excessive wind conditions, or when the ambient temperature is less than 40°F.

##### 1.4.4.1 Asphalt

Asphalt shall be used with asphalt-saturated felts. Bituminous-plastic-type flashings installed in accordance with these specifications shall be used throughout.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Asphaltic Primer

The asphaltic primer shall conform to ASTM D 41.

#### 2.1.2 Asphalt

The asphalt shall conform to ASTM D 312, Type II.

#### 2.1.3 Felt

##### 2.1.3.1 Base Sheet

Base sheet shall conform to ASTM D 4601, Type II, with no perforations.

##### 2.1.3.2 Glass Roofing Felt

ASTM D 2178, Type IV or VI, shall be impregnated with a bituminous resin coating.

#### 2.1.4 Insulation

The insulation board shall conform to ASTM C 208 (Cellulosic Fiber), Type II, Grade 1. The insulation board shall be 1 inch thick and of the widths and lengths that the Contractor elects to use. The board shall be furnished with asphalt-impregnated skins on both sides.

#### 2.1.5 Aggregate Surfacing Materials

Gravel or slag aggregate shall conform to ASTM D 1863. In lieu of gravel or blast-furnace slag, one or more of the following materials may be used when blended to the grading requirements of ASTM D 1863: marble; expanded clay; expanded slag; expanded shale of at least 55 pcf density and shall be light colored, opaque, surface dry and free from dirt or other foreign material. Testing of the material shall be the responsibility of the Contractor.

#### 2.1.6 Nailers

The nailers, of the sizes shown on the drawings, shall be structural grade Southern Pine conforming to Fed. Spec. MM-L-751. Each nailer shall be treated with pentachloropnenol (5 percent solution by weight) to a minimum retention of 0.4 pound per cubic foot of lumber. Treatment of the lumber shall be done in accordance with AWWPA standard No. P 5.

#### 2.1.7 Flashing

The flashing shall be fabricated of sheet metal and be of the size and shape as required.

#### 2.1.8 Gravel Stop and Hold-Down Clip

The gravel stop and hold-down clip shall be fabricated of either 18 ounce copper or 26 gage stainless steel. The gravel and hold-down clip shall be of the sizes and shapes as shown therefor on the drawings.

#### 2.1.9 Nails, Fasteners, and Anchors

Nails, fasteners, and anchors shall be an approved type recommended by the roofing felt manufacturer.

#### 2.1.10 Cants

Cants shall be made from treated wood or treated fiberboard and shall reduce the angle covered into two equal angles. Treated wood shall meet the requirements specified in 2.1.6 above. Wood shall be treated for moisture resistance by an environmentally acceptable method.

### PART 3 EXECUTION

#### 3.1 PREPARATION

The entire roof-deck construction of the building shall be completed and the ambient temperature shall be not lower than 40 degrees F., before roofing

work is begun thereon. The surface on which the roofing and flashings are to be applied shall be free from ice, frost, moisture, dirt, projections, and other foreign materials, and shall be smooth and firm. The roof ventilator shall be secured in position and properly prepared for flashing. All surfaces shall be inspected and approved immediately prior to application of roofing and flashing.

### 3.2 INSTALLATION OF INSULATION

Prior to the installation of the insulation, the metal roof decking shall be clean and free of any ice, water, projections, dirt, and any other objectionable material. The roof decking shall be coated with an asphaltic primer conforming to the requirements of 2.1.1 above. After the primer has been applied, a coat of hot asphalt shall be mopped onto the roof and the insulation placed immediately thereon. The mopping of the hot asphalt shall not precede the laying of the insulation by an amount of time that would allow the asphalt to cool and prevent the bonding of the insulation.

### 3.3 APPLICATION OF ROOFING

#### 3.3.1 General Requirements

The entire roofing system, including aggregate surfacing, shall be finished in one operation up to the line of termination at end of day's work. Application of roofing shall immediately follow application of insulation as a continuous operation. Phased construction will not be permitted. To insure a waterproof membrane, care shall be taken to preclude use of an excessive amount of bitumen.

#### 3.3.2 Detail Requirements:

##### 3.3.2.1 Bitumen

Bitumen shall uniformly cover all roof areas to be mopped to provide effective bond.

##### 3.3.2.2 Asphalt

Asphalt shall not be heated above 475°F. Heating kettles shall be provided with a thermometer and kettlemen shall be in attendance at all times during the heating to insure that the maximum temperature specified is not exceeded. Temperature of bitumen at the time it is applied shall be in accordance with the roofing felt manufacturer's recommendations. Application temperatures shall be measured at the mop bucket - and/or mechanical applicator. Each layer of glass-fiber felt shall be laid in not less than 20 pounds of asphalt per square or more than 30 pounds of asphalt per square.

##### 3.3.2.3 Layers of Roofing

Layers of roofing shall be laid free of wrinkles, creases or fishmouths, at right angles to the slope of the deck, immediately behind the applicator. The surface of the felts shall be broomed-in full width to obtain complete adhesion between plies and to eliminate air pockets. The method of mopping a half-sheet width and turning the sheet back to mop under the other half will not be used. Workmen shall not walk on mopped surfaces when the bitumen is

sticky. Each layer of roofing felt shall be carried up abutting vertical surfaces at least 4 inches, or to the top of the cant strip. After the last ply of roofing felt is applied, the edge envelope shall be formed by folding back and mopping each layer. The gravel stop, specified in 2.1.8 above, shall be embedded in bituminous cement and nailed on top of the envelope, formed by the felt turnbacks.

#### 3.3.2.4 Each Course

Each course of roofing felts, in addition to being mopped in hot bitumen, shall be lapped as specified in Table I inserted at the end of this section. The felts shall be nailed as specified in 3.3.2.5 below.

#### 3.3.2.5 Fastening

Nail each felt ply on 12" centers to the insulation staggered in three rows 2", 5", and 8" from upper edge with nails having not less than 20 pounds holding power. Care shall be taken to insure that the nails do not extend through the insulation and penetrate the decking. The nails shall be flush-driven through flat metal discs of not less than 1 inch diameter. The metal discs may be omitted where the heads of the nails are equivalent in size to the 1 inch metal discs.

### 3.4 FLASHING

Flashing shall be provided in the angles formed at walls and other vertical surfaces and where required to make the work watertight. Bituminous-plastic-type flashings described below shall be used. Flashings shall be provided and installed immediately after the top ply of roofing is placed and shall be returned and sealed or capped and sealed to waterproof edges and ends. Flashings shall be stepped where vertical surfaces abut sloped-roof surfaces.

#### 3.4.1 Base Flashings

Base flashings for glass-fiber felt roofing systems shall be a three-ply system using a mineral cap sheet as the outer ply. Materials and installation shall be in strict accordance with the published recommendations of the roofing felt manufacturer.

##### 3.4.1.1 Cants

Cants shall be installed in the angles formed at walls and other vertical surfaces as backing for base flashings. Cants shall be laid in a solid coat of bituminous cement just prior to laying the roofing plies. Cants shall have a 5½ inch face dimension and shall be continuous and installed in lengths as long as practicable.

#### 3.4.2 Strip Flashings

Sheetmetal flashings such as gravel stops, shall be stripped with two layers of roofing felt set in plastic cement. After installation of flashings over the top ply of roofing, the strip flashings, consisting of two layers of roofing felt, 9 and 12 inches wide, shall be successively cemented to the top of the roof flange using bituminous plastic cement, to form a waterproof joint between roofing and flashings.

### 3.5 ROOF CUTOUT SAMPLES

Samples shall be taken as directed by the Contracting Officer when there is reason to believe that deficiencies exist in the roofing membrane. When samples indicate deficiencies in the roofing membrane, corrective action shall be taken as directed.

### 3.6 SURFACING

After roofing felts have been laid and flashings installed, the roof surface, except for cants, shall be flood-coated uniformly with 60 pounds of hot asphalt per square. While bitumen is still hot, 400 pounds per square of roofing gravel or 300 pounds per square of other approved aggregate shall be embedded therein. Aggregate shall be placed in the manner and quantity required to form a compact embedded overlay. Roof surface shall be swept and all loose aggregate removed. Flood coat and aggregate shall be applied the same day as the felts are laid. If there is a probability of rain falling on the felts before the flood coat and aggregate can be applied, a light glaze coat of bitumen, 10 to 15 pounds per square, shall be applied over the exposed felts. The glaze coat may be considered as part of the flood coat provided the surfacing operation is completed within 48 hours after application of the glaze coat. Where glaze coat is used, surface treatment shall be completed as soon as weather conditions permit.

TABLE I

LAPS FOR ROOFING FELTS

Layers or plies	Laps in inches for 36-inch width	Starting widths in inches for 36-inch width
1	4	36
2	19	18 and 36
3	24-2/3	12, 24, and 36
4	27-1/2	9, 18, 27 and 36

(a) End laps of roofing felts shall be not less than 6 inches and shall be staggered a minimum of 12 inches.

--End of Section--

DIVISION 8 - DOORS, WINDOWS AND GLASS

SECTION 08112

DOORS

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	3.2	DOOR HARDWARE SCHEDULE

DIVISION 8 - DOORS WINDOWS AND GLASS

SECTION 08112

DOORS

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all shop drawings, plant, labor, and materials for the construction and installation of the pumphouse doors as described herein and/or shown on the drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Material

Suitability for use in the work, adherence to specification standards, review of certifications prior to submittal.

(2) Shop Drawings

Review of submittals for accuracy.

A copy of these records and tests, as well as the records of corrective action taken, will be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 773 Accelerated Weathering of Sealed Insulating Glass Units

ASTM E 774 Classification of the Durability of Sealed Insulating Glass Units

FEDERAL SPECIFICATIONS (FS)

TT-S-001657 (Basic) Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type (for Buildings and Other Types of Construction)

STEEL DOOR INSTITUTE SPECIFICATIONS (S.D.I)

S.D.I. 100-91 Standard Steel Doors and Frames

1.4 SHOP DRAWINGS

The Contractor shall submit shop drawings and/or manufacturer's descriptive literature, to the Contracting Officer for approval, showing and/or describing in detail the type of doors (Interior and Exterior), lock sets, hinges, closer and other accessories he proposes to use, including weather stripping for exterior doors. The shop drawings and/or literature shall be submitted to the Contracting Officer for approval in accordance with the provisions of SECTION 00800 paragraph 1.16 and SECTION 01330 - SUBMITTAL PROCEDURES.

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 PROCEDURES:

SD-01 Data

Hardware and Accessories. FIO.

Manufacturer's descriptive data, technical literature, catalog cuts, and installation instructions. Spare parts data for locksets, exit devices and closers.

Materials. FIO.

Manufacturer's descriptive data, primer, and sealer. Descriptive data for elastomeric sealants shall include shelf life, curing time, and mixing instructions for two component sealants.

SD-13 Certificates

Materials; FIO.

Certificates of compliance stating that the sealants conform to the specified requirements. Certificates shall include laboratory test reports showing that the sealants has been tested within the last 12 months.

The ambient temperature shall be within the limits of 40 to 90 degrees F when the sealants is applied.

1.6 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.

#### 1.7 SPECIAL TOOLS

Special tools, such as those supplied by the manufacturer, shall be provided as required to adjust hardware items.

#### 1.8 KEYS

Each lock will be furnished with 2 keys. The locks shall be such that the 2 keys to be furnished with each lock will work in any of the other door locks.

### PART 2 PRODUCTS (NOT APPLICABLE)

### PART 3 EXECUTION

#### 3.1 DOORS

##### 3.1.1 General

The Contractor shall furnish and install doors in the openings at the locations shown on the drawings. The doors shall include all necessary frames, hardware, thresholds and weatherstripping. The type and size of the doors shall be as shown on the drawings and/or as specified herein. Doors D-1, D-2, and D-3 shall be insulated.

##### 3.1.2 Personnel Doors (Exterior) and (Interior)

The Contractor shall furnish and install a 1-3/4 inch thick Type II, Style 3, door, conforming to S.D.I. 100 at the locations shown on the drawings, (See Door Schedule). The width and height of the door shall be as shown. The frame shall be the welded unit type. See door hardware at the end of the Section. The doors shall be factory coated with a primer paint. Painting of the doors and trim shall be as specified in SECTION 09900 - PAINTING-GENERAL. The door and frame shall be set and installed and anchored in their respective openings in accordance with the Steel Door Institute Recommendations and manufacturer's instructions.

##### 3.1.3 Thresholds

###### 3.1.3.1 Concrete Surface Preparation

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 threshold site.

### 3.1.3.2 Primer

Primer shall be used on concrete surfaces in accordance with instructions furnished with the sealant.

### 3.1.3.3 Sealant

Sealant shall be applied as recommended by the manufacturer.

### 3.1.3.4 Cleaning

The surfaces adjoining the thresholds shall be cleaned of smears and other soiling resulting from the priming and sealant application as work progresses.

### 3.1.4 Door D-3

Door D-3 shall be insulated and shall have insulating glass window units. The units shall be formed of two pieces of Type I, Class I, Quality q3 glass, separated by a ½-inch dehydrated air space, hermetically sealed. Insulating glass windows units shall have polyisobutylene primary seal with two part silicone secondary seals. Aluminum spacer frame shall have bent or soldered corners. Insulating glass units shall conform to ASTM E 773 and ASTM E 774 Class A. The door shall be factory glazed.

### 3.1.5 Roll-Up Door

The roll-up door shall be chain driven, jamb mounted type of the size shown on the drawings. The curtain slots shall be fabricated of 16-gauge steel. The hood shall be fabricated of 24-gauge steel. The door shall be furnished with all necessary angles, brackets, supports, chains and gears, and equipment used for installation and operation of the door. The door shall be weather stripped with neoprene seals and astragals. All parts of the door except the operating mechanisms, rollers and roller guides shall be factory coated with a primer paint. Painting of the door and trim shall be as specified in SECTION 09900 - PAINTING-GENERAL. Installation shall be in accordance with the manufacturer's recommendations.

## 3.2 DOOR HARDWARE SCHEDULE

Doors: D-1, D-2, D-3, D-4, and D-5.

DOOR NO.

D-1 L.H.R EXTERIOR TO VESTIBUL

HINGE:

1. 1½ PR BALLBEARING, HEAVY WEIGHT
2. FULL MORTIST, GRADE 2
3. NRP
4. 4½" X 4½" 5 KNUCKLE
5. US32 STAINLESS STEEL
6. SWAGED BARREL OFFSET

LOCK:

1. MORTISE TYPE, SERIES 1000, F04
2. REMOVABLE CORE, DEADBOLT
3. HEAVY DUTY WEIGHT

- 4. TUBELAR LEVER HANDLE WITH ROSE
  - 5. 1" THROW, ANTI-FRICTION, AUXILIARY DEAD LATCH
  - 6. STANDARD LOCK STRIKE KEEPER WITH WROUGHT BOX IN JAMB
  - 7. BRUSHED STAINLESS STEEL
- CLOSER:
- 1. SURFACE MOUNTED CLOSER, GRADE - 1
  - 2. MODERN TYPE - COVER - TOP JAMB MOUNTED WITH ARM MOUNTED TO DOOR
  - 3. 85° BACKCHECK
  - 4. PROVIDE INTEGRAL DOOR STOP
- WEATHERSTRIP:
- 1. PERIMETER SEALS EQUAL TO "NATIONAL GUARD PRODUCTS, INC."
  - 2. NO. 106NA 9/16" X 1 3/8" WIDTH
  - 3. ¼" ADJUSTMENT - SCREW ATTACHED
- D-1 CONT.
- THRESHOLD:
- 1. ALUMINUM THRESHOLD WITH INTEGRAL STP BUMPER GASKET
  - 2. EQUAL TO "NATIONAL GUARD PRODUCTS, INC." #890, ¾"X5"
  - 3. SET IN FULL BED OF SEALANT
  - 4. MECHANICAL ANCHOR TO THE SLAB.
- KICK PLATE:
- 1. 10" HIGH X DOOR WIDTH LESS 1"
  - 2. BRUSHED STAINLESS STEEL
  - 3. MOUNT ON INTERIOR SIDE OF DOOR
  - 4. NON BEVEL ACCEPTED
- DOOR BOTTOM DRIP:
- 1. DRIP EQUAL TO "ZERO" ALUMINUM #11
  - 2. SCREW ATTACH TO DOOR FACE AT DOOR BOTTOM
  - 3. STOP AT DOOR HOLDER
  - 4. SET IN SEALANT
- DOOR HOLDER:
- 1. SURFACE APPLIED TO DOOR
  - 2. LEVER OF FULCRUM TYPE
  - 3. HEIGHT TO BE BASED ON DOOR CLEARANCE
- DOOR  
D-2 L.H. FROM VESTIBULE TO OFFICE
- HINGE:
- 1. 1½ PR BALLBEARING HEAVY WEIGHT
  - 2. FULL MORTIST, GRADE 2
  - 3. NRP
  - 4. 4½" X 4½" 5 KNUCKLE
  - 5. US32 STAINLESS STEEL
  - 6. SWAGED BARREL OFFSET
- LOCK:
- 1. MORTIST TYPE, SERIES 1000, F04
  - 2. REMOVABLE CORE, DEADBOLT
  - 3. HEAVY DUTY WEIGHT
  - 4. TUBELAR LEVER HANDLE WITH ROSE
  - 5. 1" THROW, ANTI-FRICTION, AUXILIARY DEAD LATCH
  - 6. STANDARD LOCK STRIKE KEEPER WITH WROUGHT BOX IN JAMB
  - 7. BRUSHED STAINLESS STEEL

CLOSER: 1. SURFACE MOUNTED CLOSER ON DOOR  
2. GRADE-1, MODERN TYPE WITH COVER  
3. PARALLEL ARM, 85° BACKCHECK  
4. NO INTERGRAL DOOR STOP

WEATHERSTRIP: 1. PERIMETER SEALS EQUAL TO "NATIONAL GUARD PRODUCTS, INC."  
2. NO. 106NA, 9/16" X 1 3/8" WIDTH  
3. 1/4" ADJUSTMENT-SCREW ATTACHED

THRESHOLD: 1. ALUMINUM THRESHOLD WITH INTEGRAL STP BUMPER GASKET  
DOOR D-2 CONT.  
2. EQUAL TO "NATIONAL GUARD PRODUCTS, INC." #890, 3/4"X5"  
3. SET IN FULL BED OF SEALANT  
4. MECHANICAL ANCHOR TO THE SLAB.

KICKPLATE: 1. 10" HIGH X DOOR WIDTH LESS 1"  
5. BRUSHED STAINLESS STEEL  
6. MOUNT ON VESTIBULE SIDE OF DOOR  
7. NON BEVEL ACCEPTED

DOOR BUMPER: 1. WALL MOUNTED, ROUND, CONVEX PAD  
2. NO SCREWS VISIBLE

DOOR D-3 L.H. OFFICE TO TOILET

HINGE: 1. 1 1/2 PR BALLBEARING HEAVY WEIGHT  
2. FULL MORTIST, GRADE 2  
3. NO NRP FEATURE  
4. 4 1/2" X 4 1/2" 5 KNUCKLE  
5. US32 STAINLESS STEEL  
6. SWAGED BARREL OFFSET

LOCK: 1. MORTISE TYPE, SERIES 1000  
2. FUNCTION F02 PRIVACY LOCK  
3. HEAVY DUTY WEIGHT  
4. LEVER TUBELAR HANDLE WITH ROSE  
5. 1" THROW, ANTI-FRICTION  
6. STANDARD LOCK STRIKE KEEPER

KICKPLATE: 1. 10" HIGH X DOOR WIDTH LESS 1"  
2. BRUSHED STAINLESS STEEL  
3. MOUNT ON OFFICE SIDE OF DOOR  
4. NON BEVEL ACCEPTED

DOOR BUMPER: 1. FLOOR MOUNTED TYPE  
2. DOME STYLE FOR DOOR WITHOUT THRESHOLD

DOOR SILENCERS: 1. L03011 FOR METAL FRAME (SUPPLIED WITH FRAME)

DOOR

D-4 RHR MACHINE FLOOR TO OFFICE

- HINGE:
1. 1½ PR BALLBEARING, HEAVY WEIGHT
  2. FULL MORTIST, GRADE 2
  3. NRP
  4. 4½" X 4½" 5 KNUCKLE
  5. US32 STAINLESS STEEL
  6. SWAGED BARREL OFFSET
- LOCK:
1. MORTISE TYPE, SERIES 1000, F04
  2. REMOVABLE CORE, DEADBOLT
  3. HEAVY DUTY WEIGHT
  4. TUBELAR LEVER HANDLE WITH ROSE
  5. 1" THROW, ANTI-FRICTION, AUXILIARY DEAD LATCH
  6. STANDARD LOCK STRIKE KEEPER WITH WROUGHT BOX IN JAMB
  7. BRUSHED STAINLESS STEEL
- CLOSER:
1. SURFACE MOUNTED CLOSER ON DOOR
  2. GRADE-1, MODERN TYPE WITH COVER
  3. PARALLEL ARM, 85° BACKCHECK
  4. INTERGRAL DOOR STOP IN CLOSER
- WEATHERSTRIP:
1. PERIMETER SEALS EQUAL TO "NATIONAL GUARD PRODUCTS NO. INC."
  2. 106NA, 9/16" X 1 3/8" WIDTH
  3. ¼" ADJUSTMENT-SCREW ATTACHED
- THRESHOLD:  
Door  
D-4 Cont.
1. ALUMINUM THRESHOLD WITH INTEGRAL STOP BUMPER GASKET
  2. EQUAL TO "NATIONAL GUARD PRODUCTS, INC" #890, ¾" X 5"
  3. SET IN FULL BED OF SEALANT
  4. MECHANICAL ANCHOR TO THE SLAB
- KICKPLATE:
1. 10" HIGH X DOOR WIDTH LESS 1"
  2. BRUSHED STAINLESS STEEL
  3. MOUNT ON INTERIOR SIDE OF DOOR
  4. NON BEVEL ACCEPTED
- DOORSTEP:
1. PROVIDE INTERGRAL STOP IN CLOSER

DOOR  
D-5 LHR FROM EXTERIOR TO MACHINE ROOM

HINGE: 1. 1½ PR BALLBEARING, HEAVY WEIGHT  
2. FULL MORTIST, GRADE 2  
3. NRP  
4. 4½" X 4½" 5 KNUCKLE  
5. US32 STAINLESS STEEL  
6. SWAGED BARREL OFFSET

LOCK: 1. MORTISE TYPE, SERIES 1000, F04  
2. REMOVABLE CORE, DEADBOLT  
3. HEAVY DUTY WEIGHT  
4. TUBELAR LEVER HANDLE WITH ROSE  
5. 1" THROW, ANTI-FRICTION, AUXILIARY DEAD LATCH  
6. STANDARD LOCK STRIKE KEEPER  
7. BRUSHED STAINLESS STEEL

CLOSER: 1. SURFACE MOUNTED CLOASER, GRADE 1  
2. MODERN TYPE - COVER - TOP JAMB  
3. 85° BACKCHECK  
4. PROVIDE INTEGRAL DOOR STOP

WEATHERSTRIP: 1. PERIMETER SEALS EQUAL TO "NATIONAL GUARD PRODUCTS,  
INC."  
2. NO. 106NA, 9/16" X 1 3/8" WIDTH  
3. ¼" ADJUSTMENT-SCREW ATTACHED

THRESHOLD: 1. ALUMINUM THRESHOLD WITH INTEGRAL STOP BUMPER GASKET  
Door  
D-5 Cont. 2. EQUAL TO "NATIONAL GUARD PRODUCTS, INC." #890, ¼"X5"  
3. SET IN FULL BED OF SEALANT  
4. MECHANICAL ANCHOR TO THE SLAB

KICKPLATE: 1. 10" HIGH X DOOR WIDTH LESS 1"  
2. BRUSHED STAINLESS STEEL  
3. MOUNT ON MACHINE ROOM SIDE OF DOOR  
4. NON BEVEL ACCEPTED

DOOR BOTTOM DRIP: 1. DRIP EQUAL TO "ZERO" ALUMINUM #11  
2. SCREW ATTACH TO DOOR FACE AT DOOR BOTTOM  
3. STOP AT DOOR HOLDER  
4. SET IN SEALANT

DOOR STOP & HOLDER:  
WALL TYPE FOR AUTOMATIC ENGAGEMENT WHEN DOOR IS FULLY OPEN.  
ADAPT WALL RECEIVER PORTION TO SCREW ATTACH TO HANDRAIL TOP  
RAILING.

--End of Section--

DIVISION 9 - FINISHES

SECTION 09250

GYPSUM WALLBOARD

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Invitation No. DACW66-99-B-0014

DIVISION 9 - FINISHES

SECTION 09250

GYPSUM WALLBOARD

PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS

The following publications of the issue listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 36-97	Gypsum Wallboard
ASTM C 475-94	Joint Compound and Joint Tape for Finishing Gypsum Board
ASTM C 630/C 630M-96a	Water-Resistant Gypsum Backing
ASTM C 645-95a	Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board
ASTM C 754-97	Installation of Steel Framing Members to Receive Screw-Attached Gypsum
ASTM C 840-96	Application and Finishing of Gypsum Board
ASTM C 954-96a	Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
ASTM C 1002-96a	Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P8016

(1990) Specification Tested Products Guide

GYPSUM ASSOCIATION (GA)

GA 600

(1988; 12<sup>th</sup> Ed) Fire Resistance Design Manual

UNDERWRITERS LABORATORIES (UL)

UL-05

(1990; Supple) Fire Resistance Directory

1.2 DESIGN DESCRIPTION

Except where otherwise indicated or specified, the work shall conform to and shall be applied as indicated in the finish schedule.

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 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Steel Framing; FIO. Control Joints; FIO. Fire-Resistant Assemblies; FIO.

Drawings and installation details for ceiling framing, furring, special wall framing, and framed openings in walls and ceilings.

SD-13 Certificates

Gypsum Wallboard; FIO. Water-Resistant Gypsum Board; FIO.

Certificates shall state that the steel framing and wallboard meet the specified requirements.

1.4 DELIVERY AND STORAGE

Wallboard delivered prior to use shall be stored off the ground within a completely enclosed structure or completely enclosed within a weathertight covering. Wallboard shall be dry, free of warpage, and have bundling tape intact immediately prior to use. Application shall commence only after the structure is completely weathertight.

PART 2 MATERIALS

2.1 MATERIALS

Materials shall conform to the requirements specified below. Miscellaneous items not otherwise specified shall be as recommended by the wallboard manufacturer and approved prior to use. The long edges of wallboard shall be tapered, except when used only when approved in writing. Thickness of wallboard shall comply with the systems, as detailed on the drawings.

2.1.1 Steel Studs, Framing, Furring, and Related Materials:

ASTM C 645

2.1.2 Steel Studs

Provide 25 gage galvanized steel studs for gypsum drywall applications. Provide 20 gage galvanized steel studs adjacent to door frames. Provide studs in depths shown on the Drawings.

2.1.3 Resilient Channels

Provide 25 gage galvanized steel, 1/2" X 2-1/2" channels designed to isolate sound and accept drywall.

2.1.4 Gypsum Wallboard

ASTM C 36; regular, foil-backed, as required; 48-inches wide.

2.1.5 Water Resistant Gypsum Board

ASTM C630

2.1.5.1 Sink Areas

At sink areas, walls on studs and all other fixture walls; finish surface shall be paintable.

2.1.5.2 Type Z

Provide Type Z for roof insulation underlayment.

#### 2.1.6 Thickness

Refer to Drawings for gypsum thickness.

#### 2.1.7 Joint Treatment Materials:

ASTM C 475

##### 2.1.7.1 Taping or Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum wallboard joints and fastener heads and completely compatible with tape and substrate.

##### 2.1.7.2 Finishing or Topping Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape and substrate.

##### 2.1.7.3 Joint Tape

Reinforcing tape recommended by the manufacturer.

#### 2.1.8 Screws

ASTM C 1002, Type G for attachment of gypsum board to gypsum board, Type S for attachment to light-gauge steel members.

#### 2.1.9 Cornerbead and Edge Trim

Corrosion protective-coated steel designed for its intended use. Flanges shall be free of dirt, grease, and other materials that may adversely affect the bond of joint treatment.

#### 2.1.10 INSULATION

##### 2.1.10.1 Boards

On the three exterior walls where 1" thick rigid insulation is to be applied the Contractor shall submit samples of the insulation board he proposes to use and how he proposes to fasten the insulation to the concrete block wall. The boards may be obtained locally.

##### 2.1.10.2 Batts

In the interior walls and in the ceiling as shown on the drawings the Contractor shall submit samples of the batts he proposes to use with the thickness of the batts to be used in wall and in the ceiling over the acoustical tiles. The insulation batts maybe obtained locally.

## PART 3 EXECUTION

### 3.1 Steel Framing

Installation of steel framing shall conform to ASTM C 754, except that limiting heights shall be according to manufacturer's current published data. Framing shall be spaced as detailed on the drawings with a maximum of 24 inches on center.

#### 3.1.1 Partition Framing System

Metal framing and furring system shall be capable of carrying a transverse load of 5 psf without exceeding either the allowable stress or a deflection of L/240.

#### 3.1.2 Special Framing

Framing for special items shall be built to the sizes, shapes, or forms indicated and shall be rigidly secured to each intersection with wallboard screws.

#### 3.1.3 Wall Openings

For wall openings such as required for doors and access panels, the framing system shall provide for the installation and anchorage of the required subframes or finish frames. Partitions abutting continuous suspended ceilings shall be strengthened for rigidity at rough openings, such as door openings, of more than 30-inches wide. Studs at openings shall be 20 gauge minimum bare metal thickness and spot grouted at jamb anchor inserts. Double studs shall be fastened together and secured to floor and overhead runners with screws.

### 3.2 CONTROL JOINTS

Control joints shall be installed in accordance with ASTM C 840, with the following additional requirements: Ceiling-height doorframes may be used as vertical control joints for partitions. Doorframes of less than ceiling height may be used as control joints only if standard control joints extend to the ceiling from both corners of the top of doorframe. Control joints in the ceiling shall be located to intersect column penetrations. In wall lengths over 30 feet, window openings shall be treated in same manner as shown for doors.

### 3.3 APPLICATION OF GYPSUM WALLBOARD

#### 3.3.1 General

Gypsum wallboard shall be applied to framing and furring members in accordance with ASTM C 840. Gypsum wallboard shall be applied with separate boards in moderate contact without forcing in place. End joints of adjoining boards shall be staggered. Abutting end and edge joints shall be neatly fitted. Use gypsum wallboard of maximum practical length. Gypsum wallboard shall be cut as required

to make neat close joints around openings. In vertical application of gypsum wallboard, panels shall be of length required to reach full height of vertical surfaces in one continuous piece. Surfaces of gypsum wallboard and substrate members may be adhered together with an adhesive. In single-ply installations and the first layer in a multi-ply installation, all ends of gypsum wallboard shall occur over framing members or other solid backing except where treated joints occur at right angles to framing or furring members.

#### 3.3.2 Application to Block Wall

The Contractor shall submit shop drawings to the Contracting Officer for approval showing how he proposes to fasten the wall board to the 1" thick insulation board that is already fastened to the concrete block wall.

#### 3.4 VAPOR RETARDER

Vapor retarder shall be installed with joints over framing members. Joints shall be lapped for the full width of the framing members. Foil-backed wallboard may be used in lieu of a separate vapor retarder sheet, in which case the reflective surface of the foil-backed wallboard shall be placed against the face of the framing members.

#### 3.5 FINISHING OF GYPSUM WALLBOARD

Gypsum wallboard shall be taped and finished in accordance with ASTM C 840. Joint, Fastener depression, and corner treatment shall be provided.

#### 3.6 PATCHING

Surface defects and damage shall be corrected as required to leave gypsum wallboard smooth, uniform in appearance, and ready to receive finish as specified.

-- End of Section --

DIVISION 9 - FINISHES

SECTION 09510

ACOUSTICAL CEILINGS

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DIVISION 9 - FINISHES

SECTION 09510

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 APPLICABLE PUBLICATION

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 635-95	Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C 636-96	Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM E 90-97	Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
ASTM E 119-95a	Fire Tests of Building Construction and Materials
ASTM E 413-87 And Ed. Cmt. 1 (R 1994)	Rating Sound Insulation

CEILINGS AND INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION (CISCA)

CISCA AMA-I-II	(1967) Ceiling Sound Transmission Test by Two Room Method
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FEDERAL SPECIFICATIONS (FS)

FS SS-S-118	(Rev B) Sound Controlling (Acoustical) Tiles and Panels
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1.2 GENERAL REQUIREMENTS

Acoustical treatment shall consist of sound controlling units mechanically Mounted on a suspended ceiling system. The unit size, texture, finish, and color shall be as specified herein. The location and extent of acoustical treatment shall be as shown on the drawings.

### 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 01330 SUBMITTAL PROCEDURES:

#### SD-01 Data

Acoustical Ceiling System; FIO.

Manufacturer's descriptive data and installation instructions.

#### SD-04 Drawings

Acoustical Ceiling System; FIO.

Drawings shall show suspension system, method of anchoring and fastening, and reflected ceiling plan.

#### SD-14 Samples

Acoustical Units; GA.

Two samples of each type of acoustical unit showing texture, finish, and color.

### 1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Materials shall be carefully handled and stored in dry, watertight enclosures. Immediately before installation, acoustical units shall be stored for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed to assure temperature and moisture conditions.

### 1.5 SCHEDULING

Interior finish work such as concrete work shall be completed and dry before Installation. Mechanical, electrical, and other work above the ceiling line shall be completed and heating, ventilating, and air conditioning systems shall be installed and operating in order to maintain temperature and humidity requirements.

### 1.6 EXTRA STOCK

Furnish to the Contracting Officer one box of unopened ceiling tile to match each type of ceiling tile used.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

Acoustical units shall conform to FS SS-S-118, Class A, and the following requirements:

2.1.1 Units for Exposed-Grid System

Type: III.  
NRC grade: 55 minimum when tested on mounting No. 7.  
Pattern: d.  
Nominal size: 24 by 48 inches.  
Edge detail: Trimmed and butt.  
Finish: Factory-applied white finish.  
LR grade: 1.  
STC range: 40-44

2.2 SUSPENSION SYSTEM

Suspension system shall be exposed-grid and shall conform to ASTM C 635 for intermediate-duty systems. Surfaces exposed to view shall be aluminum in vehicle storage and steel elsewhere with a factory-applied white baked-enamel finish. Wall molding shall have a flange of not less than 15/16 inch, same material as grid face and shall be provided with outside corner caps. Inside corner caps shall be provided where, due to the configuration of the installation, they are needed to produce a workmanlike appearance.

2.3 HANGERS

Hangers shall be galvanized steel wire. Hangers and attachment shall support a minimum 300-pound ultimate vertical load without failure of supporting material or attachment.

2.4 SOUND INSULATION

2.4.1 Dense Sound Type

Dense sound type spun mineral or glass fiber batt insulation, for good sound attenuation, for interior walls and ceilings, conforming to ASTM C615, Type I. Where used in the walls the walls shall have a minimum STC 46. Where used over the ceiling the ceiling assembly shall have a minimum STC 43. Insulation shall be 3 inches thick.

2.4.2 Fire Test Results

Fire Test Results: Noncombustible in accordance with ASTM E136; flame spread 25, smoke developed 50 when tested per ASTM E84.

PART 3 EXECUTION

3.1 INSTALLATION

Acoustical work shall be provided complete with all necessary fastenings, clips, and other accessories required for a complete installation. Mechanical fastenings shall not be exposed in the finished work. Hangers shall be laid out for each individual room or space. Hangers shall be placed to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Main runners and carrying channels shall be kept clear of abutting walls and partitions. At least two main runners shall be provided for each ceiling span. Wherever required to bypass an object with the hanger wires, a subsuspension system shall be installed, so that all hanger wires will be plumb. Splayed hanger wires may be used if an opposite countersplayed wire of the same angle as the first wire is installed and attached to the same supporting member.

3.1.1 Suspension System

Suspension system shall be installed in accordance with ASTM C 636 and as specified herein. There shall be no hanger wires or other loads suspended from underside of steel decking. Provide earthquake bracing.

3.1.1.1 Plumb Hangers

Hangers shall be plumb and shall not press against insulation covering ducts and pipes.

3.1.1.2 Splayed Hangers

Where hangers must be splayed (sloped or slanted) around obstructions, offset the resulting horizontal force by bracing, countersplaying, or other acceptable means.

3.1.2 Wall Molding

Wall molding shall be provided where ceilings abut vertical surfaces. Wall molding shall be secured not more than 3 inches from ends of each length and not more than 16 inches on centers between end fastenings.

3.1.3 Ceiling Tiles

Ceiling tiles shall be installed in accordance with the approved installation instructions of the tile manufacturer. Edges of ceiling tiles shall be in close contact with metal supports, with each other, and in true alignment. Tile shall be arranged so that units less than one-half width are minimized. Panels in exposed-grid system shall be held in place with manufacturer's standard hold-down clips, if panels weigh less than 1 psf.

### 3.2 CLEANING

Following installation, dirty or discolored surfaces of acoustical units shall be cleaned and left free from defects. Units that are damaged or improperly installed shall be removed and new units provided as directed.

--End of Section--

DIVISION 9 - FINISHES

SECTION 09900

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DIVISION 9 – FINISHES

SECTION 09900

PAINTING, GENERAL

PART 1 GENERAL

1.1 SCOPE

The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with preparation of surfaces and application of paint and other specified materials. This work shall be accomplished in complete and strict accordance with the specifications and the applicable drawings and shall be subject to the terms and conditions of the contract.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for all operations to assure compliance with contract requirements and maintain records of his quality control for all construction operations, including but not limited to the following:

- (1) Materials. Quality, packaging, labeling, storage, mixing.
- (2) Preparation of Surfaces. Cloths, solvents, dust-free work areas, machinery protection, methods used, adherence to specified standards, timely application of prime and protective coat after cleaning.
- (3) Application. Temperature, surface conditions, holidays, bubbles, runs, protection of surfaces after painting, timely application of coats, methods of application, minimum drying periods, coverage, ventilation in enclosed areas, paint systems.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished to the Government daily.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- |                             |   |
|-----------------------------|---|
| A 123-89a<br>and Ed. Cmt. 1 | Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products |
| D 304-95                    | N-Butyl Alcohol (Butanol)                                     |

D 520-84 and Ed. Cmt. 1 (R 1995)	Zinc Dust Pigment
D 841-95	Nitration Grade Toluene
D 843-95	Nitration Grade Xylene
D 1045-95	Sampling and Testing Plasticizers Used in Plastics
D 1763-94	Epoxy Resins

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID-A-A-2247	(Basic) Paint, Latex (Semigloss, Interior)
CID-A-A-2994	(Basic) Primer Coating, Interior for Walls and Wood

COMPRESSED GAS ASSOCIATION, INC. (CGA)

Pamphlet G-7.1	Commodity Specification for Air, Third Edition
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ENGINEERING MANUAL (EM)

EM 385-1-1	U.S. Army Corps of Engineers Safety and Health Requirements Manual
EM 1110-2-3400	U.S. Army Corps of Engineers Painting: New Construction and Maintenance Manual

FEDERAL SPECIFICATIONS (FS)

TT-C-535	(Rev. B; Am. 2) Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete and Masonry
TT-P-29	(Rev. J; Am. 1; Int. Am. 2) Paint, Latex Base, Interior, Flat, White and Tints
TT-P-38E	Paint, Aluminum (Ready-Mixed)
TT-E-490E(2)	Enamel, Silicone Copolymer, Semi-Alkyd Gloss
TT-I-735A & Am-3	Isopropyl Alcohol
TT-P-1046A	Primer Coating; Zinc Dust, Chlorinated Rubber, (for Steel and Galvanized Surfaces)

Fed. Standard 595a & change Notices No. 2 thru 9	Colors
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MILITARY SPECIFICATIONS (MS)

DOD-P-15328D	Primer (Wash), Pretreatment (Formula No. 117 & Int Am-2 Metals)
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DOD-P-21035A	Paint, High Zinc Dust Content, Galvanizing Repair
MIL-P-26915B	Primer Coating, Zinc Dust Pigmented, For Steel Surfaces

#### STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC-SP 3-89	Power Tool Cleaning
SSPC-SP 5-89	White Metal Blast Cleaning
SSPC-SP 7-89	Brush-Off Blast Cleaning
SSPC-Paint 16-82	Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint
SSPC-Paint 25-91	Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments)

## 1.4 SPECIAL FORMULATIONS

Special formulations indicated herein that are not covered by Federal or other nationally recognized standard specifications are specified in 2.1 below.

## 1.5 DEFINITIONS AND NOMENCLATURE

### 1.5.1 Paint

The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, whether they be used as prime, intermediate, or finish coats. This definition does not include troweled or sprayed-metal coatings.

### 1.5.2 Shop Painting

The term "shop painting" as referred to herein and/or on the drawings covers surface preparation and painting operations conducted in a shop, mill, or plant, before shipment of paint-receiving items to the project site.

### 1.5.3 Field Painting

The term "field-painting" as referred to herein and/or on the drawings covers surface preparation and painting operations conducted at the project site.

### 1.5.4 Touchup Painting

The term "touchup painting" refers to the application of paint on small areas of painted surfaces to repair mars, scratches, and other defects where the coating has deteriorated in order to restore the coating to an unbroken condition.

### 1.5.5 Repainting

The term "repainting" designates the cleaning and recoating with the same or similar materials originally used on extensive areas on which the existing coatings have deteriorated or otherwise have not provided adequate protection.

## 1.6 SUBMITTALS

### 1.6.1 Special Formulation Paints and Thinners

The Contractor shall submit a signed certificate from the paint manufacturer showing the percentage of each ingredient used to produce the material and a statement that the material complies with all of the requirements of the formulation. Each ingredient shall be clearly identified as provided for above.

### 1.6.2 Federal and Military Specification Paints and Thinners

The Contractor shall submit either of the following:

(1) A certified test report showing the results of required tests made on the material and a statement that it meets all of the specification requirements.

(2) A certified test report showing the results of required tests made on a previous batch of paint produced by the same firm using the same ingredients and formulation except for minor differences necessitated by a color change and a statement that the previous batch met all of the specification requirements. He shall also supply a report of tests on the proposed batch showing the following properties applicable to the material specifications: color, gloss, drying time, opacity, viscosity, weight per gallon, and fineness of grind.

### 1.6.3 Proprietary Brands of Paints

A proprietary name brand, shelf item paint of the same type and with similar properties to the material specified may be proposed without sampling. To receive consideration the paint must be in the original container with the manufacturer's label affixed. The Contractor shall submit a statement from the supplier that the paint is appropriate as to type, color and gloss and is a premium grade of paint.

## 1.7 PACKAGING, LABELING AND STORAGE

Paints shall be so processed and packaged as to insure that within a period of 1 year from date of manufacture, they will not gel, liver or thicken deleteriously, or form gas in the closed container. Paints, unless otherwise specified or permitted, shall be packaged in standard containers not larger than 5 gallons in size, with removable friction or lug-type covers. Each container of paint or separately packaged component thereof shall be clearly and durably labeled to indicate the purchaser's order number, date of manufacture, manufacturer's batch number, quantity, color, component identification, and the designated name formula or specification number of the paint together with special labeling instructions, when specified. Paint shall be delivered to the job in unbroken containers. Paints that can be harmed by exposure to cold weather shall be stored in ventilated, heated shelters. All paints shall be stored under cover from the elements and in locations free from sparks and flames.

## 1.8 SAFETY AND HEALTH PROVISIONS

The Contractor shall comply with the safety and health provisions contained in the Clause entitled "Accident Prevention", FAR 52.236-13. These additional provisions are intended to amplify those contained in the aforementioned clause. In any conflict between the "Accident Prevention" clause and this section, the provisions of this section shall govern. The Contractor shall develop all required safety and health plans and procedures consistent with current Federal regulations as described in 29 CFR 1926, Safety and Occupational Safety and Health Standards; 29 CFR 1926, Safety and Health Regulations for Construction; EM 385-1-1; US Army Corps of Engineers Safety and Health Requirements Manual; and permissible exposure limits (PELS) contained in the latest edition of the booklet entitled, "Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment and Biological Indices with Intended Changes".

The Contractor shall comply with the more stringent PELs contained in either 29 CFR Part 1910 or the American Conference of Governmental Industrial Hygienist (ACGIH) booklet.

PART 2 PRODUCTS

2.1 SPECIAL PAINT FORMULATIONS NOT COVERED BY STANDARD SPECIFICATIONS

2.1.1 Exceptions

The ingredient materials described in this section are applicable only to the special paint formulations specified hereinafter and not to those finished-product coatings governed by Federal or other standard specifications.

2.1.2 General

Special paints shall have the composition as indicated in the formulas listed herein. Where so specified, certain components of a paint formulation shall be packed in separate containers for mixing on the job.

2.1.3 Colors and Tints

The color shall be that naturally obtained from the required pigmentation.

2.1.4 Paint Formulations

2.1.4.1 Epoxy Zinc-Rich Paint (Formula E-303d)

<u>Ingredients</u>	<u>Percent by Weight</u>	<u>Pounds</u>	<u>Gallons</u>
COMPONENT A			
Epoxy Resin, Type 1	35.9	277.8	28.06
Methyl Amyl Ketone	44.2	342.5	50.37
Toluene	6.0	46.3	6.86
Butanol	6.0	46.3	6.94
Suspending Agent M	6.5	50.0	6.89
Phthalocyanine Blue Pigment	<u>1.4</u>	<u>11.0</u>	<u>.88</u>
	100.00	773.9	100.00

COMPONENT B

Polyamide Resin	38.1	277.8	33.88
Isopropanol	12.7	92.6	14.16
Toluene	12.7	92.6	12.79
Butanol	35.4	257.6	38.17
Catalyst	<u>1.1</u>	<u>8.1</u>	<u>1.00</u>
	100.0	728.7	100.00

## COMPONENT C

Zinc Dust Pigment	100.0	5,000.0	85.32
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### 2.1.4.1.1 Packaging and Labeling

Components A, B, and C of Formula E-303d shall be packaged separately as kits (unitized packaging permissible). The Standard size kit shall be 2.85 gallons (mixed paint volume) consisting of one gallon of Component A, one gallon of Component B and 50 pounds of zinc dust (Component C) packaged in a two gallon pail. Kits of larger or smaller sizes will be permitted, provided that the quantity relationship of the components shall be the same as the standard kit. In addition to standard labeling requirements, each container of each component shall be properly identified as to component type and each container label of Component A shall carry the following: "MIXING INSTRUCTIONS: To prepare this paint for application, combine components A and B and, while the mixture is being vigorously stirred with a heavy duty power stirrer, sift in the zinc dust (Component C). Continue the stirring until the zinc dust has been well dispersed and the mixture is smooth. The mixed paint shall at some point be strained through a 30-60 mesh screen to prevent any undispersed zinc dust slugs from reaching the spray gun nozzle. Thin with an appropriate thinner where necessary to obtain satisfactory application results. The pot life of the mixed material, extended from time to time by the addition of small amounts of thinner, will normally be in excess of 24 hours but may be less in very warm weather. Stir the material continuously after mixing and during application." Care shall be taken during mixing to avoid contact with skin by the use of gloves, safety goggles, and filter type dust respirators.

### 2.1.4.1.2 Samples

Samples of Formula E-303d paint submitted for testing shall be accompanied by a list showing all of its raw material ingredients, the name of the manufacturer of each, and the trade name and/or code designation by which the producer identifies his ingredient product.

### 2.1.4.2 Coal Tar Epoxy-Polyamide Black Paint

This paint shall conform to SSPC-Paint 16 manufactured with Type 1 Pitch. Finished product samples submitted for approval shall be accompanied by a list showing all of its raw material ingredients, the name of the manufacturer of each, and the trade name and/or code designation by which the producer identifies his ingredient product.

## 2.1.5 Ingredient Materials and Thinners for Special Paint Formulations

The following ingredient materials apply only to those paints whose formulations are shown above in detail.

### 2.1.5.1 Pigments and Suspending Agents

#### 2.1.5.1.1 Zinc Dust Pigment

Zinc dust pigment shall conform to ASTM D 520, Type I or II.

#### 2.1.5.1.2 Phthalocyanine Blue

Phthalocyanine blue pigment for epoxy zinc-rich paint shall have properties similar and equal to Peacock Blue 249-1282 manufactured by Sun Chemical Co.

#### 2.1.5.1.3 Suspending Agent M

Suspending Agent M shall be of soft translucent paste consisting of a thixotropic agent dispersed in toluene. It shall

have a nonvolatile content of approximately 25 percent and a specific gravity of approximately 0.872. It shall be capable of minimizing the tendency of zinc dust to settle hard without increasing the viscosity of the paint significantly. MPA-60 (toluene), produced by the Baker Castor Oil Co., has these properties or an approved equal that has these properties may be used.

#### 2.1.5.2 Resins, Plasticizer and Catalyst

##### 2.1.5.2.1 Catalyst

The catalyst for epoxy zinc-rich paint shall be 2, 4, 6 tri (dimethylamino methyl) phenol. DMP-30, Rohm & Haas Co., is such a chemical, or an approved equal may be used.

##### 2.1.5.2.2 Epoxy Resin

The epoxy resin for epoxy zinc-rich paint (Formula E-303d) shall be of the solid type conforming to ASTM Designation D 1763 for a Type I, Grade I, Class IV resin except that it shall have WPE of 425-550 and its softening point shall be between 65 and 75.

##### 2.1.5.2.3 Polyamide Resin

The polyamide resin for epoxy zinc-rich paint (Formula E-303b) shall be a condensation product of a dimerized fatty acid and polyamides. It shall be a solid resin at room temperature and have the following characteristics:

	<u>Minimum</u>	<u>Maximum</u>
Amine value	85	95
Color (Gardner)	--	12
Specific Gravity, 25/25 degrees C.	0.97	0.99
Viscosity, Poises, 150 degrees C. (Brookfield)	7	9

#### 2.1.5.3 Solvents and Thinners

##### 2.1.5.3.1 Isopropanol (99 Percent)

Isopropanol (99 percent) shall conform to Federal Specification TT-I-735, Grade A.

##### 2.1.5.3.2 Butanol (Butyl Alcohol)

Butanol (Butyl Alcohol) shall conform to ASTM Designation: D 304.

##### 2.1.5.3.3 Methyl Amyl Ketone (MAK)

Methyl Amyl Ketone (MAK) shall be at least 97 percent purity, shall have a distillation range of 140° to 154°C., and shall have a specific gravity (at 20/20°C.) of 0.816 to 0.818. The material shall have an acid number (ASTM D 1045) of not more than 0.20.

##### 2.1.5.3.4 Toluene

Toluene shall conform to ASTM D 841.

## 2.2 HAZARDOUS MATERIALS RESTRICTIONS

Paints and painting practices shall comply with all applicable state and local laws enacted to insure compliance with Federal Clean Air Standards.

### 2.2.1 Lead

Use of lead based primers is prohibited.

### 2.2.2 Mercury

Mercurial fungicides shall not be used in exterior oil paints.

## PART 3 EXECUTION

### 3.1 CLEANING AND PREPARATION OF SURFACES TO BE PAINTED

#### 3.1.1 General

Surfaces to be painted shall be clean before applying paint or surface treatments. The removal of oil and grease shall, in general, be accomplished with mineral spirits or other low-toxicity solvents having a flashpoint above 100 degrees F before any mechanical cleaning is started. Solvent cleaning shall be done with clean cloths and clean fluids to avoid leaving a thin film of greasy residue on the surfaces being cleaned. Cleaning and painting shall be so programmed that dust or other contaminants from the cleaning process do not fall on wet, newly painted surfaces, and surfaces not intended to be painted shall be suitably protected from the effects of cleaning and painting operations. Welding of, or in the vicinity of, previously painted surfaces shall be conducted in a manner to prevent weld spatter from striking the paint and to otherwise reduce coating damage to a minimum; paint damaged by welding operations shall be restored to original condition. Machinery shall be protected against entry of blast abrasive and dust into working parts. Surfaces to be painted that will be inaccessible after construction, erection, or installation operations are completed shall be painted before they become inaccessible.

#### 3.1.2 Concrete and Masonry Surfaces

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.

#### 3.1.3 Ferrous Surfaces

##### 3.1.3.1 Ferrous Surfaces in Atmospheric Exposure

Ferrous surfaces that are to be permanently and continuously in exterior or interior atmospheric exposure and other surfaces as directed shall be cleaned by means of power tools or by dry blasting to the brush-off grade. Cleaning and priming shall be done in or at the shop unless otherwise directed or permitted. Power tool cleaning shall conform to the requirements of SSPC-SP 3. Brush-off blast cleaning shall conform to the requirements of SSPC-SP 7. Irrespective of the overall cleaning method used, welds and adjoining surfaces within a few inches thereof shall be cleaned of weld flux, spatter, and other harmful deposits by blasting, power impact tools, power wire brush, or such combination of these and other methods as may be necessary for complete removal of each type of deposit. The combination of cleaning methods need not include blasting when preparation of the overall surfaces is carried out by the power tool method, but brush scrubbing and rinsing with clean water, after mechanical cleaning is completed, will be required unless the latter is carried out with such thoroughness as to remove essentially all soluble alkaline deposits. Wetting of the surfaces during water-washing operations shall be limited to the weld area required to be treated, and such areas shall be dry before painting.

Welds and adjacent surfaces cleaned thoroughly by blasting alone will be considered adequately prepared provided that weld spatter not dislodged by the blast stream shall be removed with impact or grinding tools. All surfaces shall be primed as soon as practicable after cleaning but in any event prior to any contamination or deterioration of the prepared surfaces. Steel surfaces shall be cleaned (and primed) prior to lengthy outdoor storage in order to minimize breakdown of mill scale and consequent rusting.

#### 3.1.3.2 Ferrous Surfaces Subject to Immersion

Ferrous surfaces subject to extended periods of immersion or otherwise as required shall be dry blast cleaned to a grade approaching White Metal grade which shall be in accordance with SSPC-SP 5, except that a limited relaxation from the uniform White Metal grade of surface cleanliness will be permitted, as described below. The metal shall be cleaned to such a degree that if a large surface were divided approximately into 6-inch squares, at least 75 percent of the subdivisions would meet the White Metal grade of cleanliness and the remaining subdivisions would be randomly distributed. Within these small, randomly distributed areas a minor relaxation from White Metal cleanliness will be permitted, consisting only of very slight shadows, stains, and discolorations stemming from very thin, adherent, sparsely scattered residues of mill scale and corrosion products. No relaxation from the White Metal grade will be permitted on surface irregularities such as edges, interior angles, welds, rivet lines, and junctions of joining members. The overall blasting effort expended shall be not less than two-thirds (2/3) of that which would be required to accomplish the White Metal grade of cleanliness on the specific surfaces involved, but this limitation shall not be construed as a waiver of any of the requirements above. Weld spatter not dislodged by blasting shall be removed with impact or grinding tools. Surfaces shall be dry at the time of blasting. Blast cleaning to a grade approaching White Metal shall be performed in the field and, unless otherwise specifically authorized, after final erection. Within 8 hours after cleaning, prior to the deposition of any detectable moisture, contaminants, or corrosion, all ferrous surfaces blast cleaned to a grade approaching White Metal shall be cleaned of dust and abrasive particles by brushing, vacuum cleaning, and/or blowdown with clean, dry compressed air, and given the first coat of paint. Upon written request by the Contractor, the Contracting Officer may authorize mill or shop cleaning of assembled or partially assembled components. The surfaces if shop blasted, shall be shop coated with a coat of zinc rich epoxy primer or inorganic zinc rich paint, according to the specified paint system. These surfaces shall receive an extra single spray coat of the zinc primer or zinc paint at the time field painting is started, as specified in the paint system instructions. The shop coating shall be maintained in good condition by cleaning and touching up in areas damaged during the construction period. Appearance of pinpoint or general rusting prior to application of field coats will be considered as evidence of poor workmanship, requiring reblasting and repainting at no added cost to the Government. Prior to the field application of subsequent coats, soiled areas of the shop coating shall be thoroughly cleaned and all welds or other unpainted or damaged areas shall be cleaned and coated in such a manner as to make them equivalent to adjacent, undamaged paint surfaces.

#### 3.1.4 Galvanized, Aluminum, Aluminum Alloy, or Copper Surfaces

Where such surfaces are specified to be painted, they shall be first washed with clean mineral spirits and then pretreated with a primer conforming to Mil. Spec. DOD-P-15328 in accordance with the following instructions. The pretreatment primer shall be mixed by adding 1 volume of acid component (diluter) to 4 volumes of resin component (base solution) slowly and with constant stirring. After mixing, the material shall be used within 8 hours. The pretreatment primer shall be spray applied at a coverage rate of 250 to 300 square feet per gallon (of resin component) to give a dry film thickness of 0.3 to 0.5 mil. Small areas may be coated by brush or swab. Care shall be exercised in spray application to avoid the deposition of dry particles on the surface. A wet spray shall be maintained at all times by additional thinning with Normal Butanol (ASTM D 304) where required by prevailing weather conditions. The acid component (diluter), over and above the amount prescribed above, shall not be used for thinning purposes. Surfaces shall receive the first coat of paint after at least 1 but not more than 24 hours drying of the pretreatment primer film.

#### 3.1.5 Gypsum Board Surfaces

Gypsum board surfaces shall be dry and shall have all loose dirt and dust removed by brushing with a soft brush, rubbing with a dry cloth, or vacuum cleaning prior to application of the first-coat material.

## 3.2 PAINT APPLICATION

### 3.2.1 General

The finished coating shall be free from holidays, pinholes, bubbles, runs, drops, ridges, waves, laps, unnecessary brush marks, and variations in color, texture, and gloss. Application of initial or subsequent coatings shall not commence until a Government representative has verified that atmospheric conditions and the surfaces to be coated are satisfactory or has waived specific verification. All paint coats shall be applied in such manner as to produce an even, continuous film of uniform thickness. Edges, corners, crevices, seams, joints, welds, rivets, and other surface irregularities shall receive special attention to insure that they receive an adequate thickness of paint. Spray equipment shall be equipped with traps and separators and where appropriate, mechanical agitators, pressure gages, pressure regulators, and screens or filters.

Air caps, nozzles, and needles shall be as recommended by the spray equipment manufacturer for the material being applied.

### 3.2.2 Mixing and Thinning

Paints shall be thoroughly mixed, strained where necessary, and kept at a uniform composition and consistency during application. Paste or dry powder pigments specified to be added at the time of use shall, with the aid of powered stirrers, be incorporated into the vehicle or base paint in such a manner as to produce a smooth, homogeneous mixture, free of lumps and dry particles. Where necessary, in the opinion of the inspector, to suit conditions of surface, temperature, weather, and method of application, the packaged paint may be thinned immediately prior to use by the addition of not more than 1 pint per gallon of the proper thinner, provided that this general limitation shall not apply when more specific thinning instructions are provided. Paint that has been stored at low temperature, shall be brought up to at least 70 degrees F before being mixed and thinned, and its temperature in the spray tank or other working container shall not fall below 60 degrees F during the application. Paint that has deteriorated in any manner to such degree that it cannot be restored to essentially its original condition by customary field-mixing methods shall not be used and shall be removed from the project site. Paint and thinner that is more than 1 year old shall be sampled and submitted for testing to determine its suitability for application.

### 3.2.3 Atmospheric and Surface Conditions

Paints shall be applied only to surfaces that are above the dewpoint temperature and that are completely free of moisture as determined by sight and touch. In no case shall any paint be applied to surfaces upon which there is detectable frost or ice. Except as otherwise specified, the temperature of the surfaces to be painted and of air in contact therewith shall be not less than 45 degrees F during paint application nor shall paint be applied if the surfaces can be expected to drop to 32 degrees F or lower before the film has dried to a reasonably firm condition. During periods of inclement weather, painting may be continued by enclosing the surfaces and applying artificial heat, provided the minimum temperatures and surface dryness requirements prescribed above are maintained. Paint shall not be applied to surfaces heated by direct sunlight or other sources to temperatures that will cause detrimental blistering, pinholing, or porosity of the film.

### 3.2.4 Time between Surface Preparation and Painting

Surfaces that have been cleaned and/or otherwise prepared for painting shall be primed as soon as practicable after such preparation has been completed, but in any event, prior to any deterioration of the prepared surface.

### 3.2.5 Method of Paint Application

Unless otherwise specified, paint shall be applied by brush or spray to ferrous and nonferrous metal surfaces. Special attention shall be directed toward insuring adequate coverage of edges, corners, crevices, rivets, bolts, welds, and similar surface irregularities. Other methods of application to metal surfaces shall be subject to the specific approval of the Contracting Officer. Whenever application of paint by a specific method to a surface is permitted or directed, it is to be understood that all areas inaccessible to that method shall be coated by alternate means.

### 3.2.6 Masonry Surfaces

Masonry surfaces may be coated by brush, roller, or spray.

### 3.2.7 Coverage and Film Thickness

#### 3.2.7.1 General

The actual surface area covered per gallon of paint shall not exceed the spreading rates prescribed for specific paints. Where no spreading rate is specified, the paint shall be applied at a rate normal for the type of material being used. In any event, the combined coats of a specified paint system shall completely hide base surface and the finish coats shall completely hide undercoats of dissimilar color.

#### 3.2.7.2 Measurements on Ferrous Metal

Where dry film thickness requirements are specified for coatings on ferrous surfaces, measurements shall be made with one of the thickness gages listed below. They shall be calibrated on metal practically identical in composition and surface preparation to that being coated and be of substantially the same thickness except that for measurements on metal thicker than 1/4-inch the instrument may be calibrated on metal with a minimum thickness of 1/4-inch. When calibrating any of the gages for making film measurements of over 3 mils, the calibrating thickness standards (shims) shall be of nonmetallic composition. Where only one thickness is specified, i.e., either a minimum or an average, the calibrating shim's thickness shall closely approximate the specified thickness but where both thicknesses are specified the shim's thickness shall closely approximate an average of the two. Calibrating instructions, thickness standards, and in the case of the Mikrotest gage, a calibrating tool, should be obtained from the manufacturer or supplier of the gage. Authorized thickness gages:

Mikrotest, Elektro-Physik, Inc.  
Inspector Gage, Elcometer Instruments, Ltd.  
Positest, Defelsko Corporation  
General Electric, Type B, General Electric Company  
Minitector, Elcometer Instruments, Ltd.  
Positector 2000, Defelsko Corporation

### 3.2.8 Progress of Painting Work

Where field painting on any type of surface has commenced, the complete painting operation, including priming and finishing coats, on that portion of the work, shall be completed as soon as practicable, without prolonged delays. Sufficient time shall elapse between successive coats to permit them to dry properly for recoating, and this period shall be modified as necessary to suit adverse weather conditions. Paint shall be considered dry for recoating when it feels firm, does not deform or feel sticky under moderate pressure of the finger, and the application of another coat of paint does not cause film irregularities such as lifting or loss of adhesion of the undercoat. All coats of all painted surfaces shall be unscarred and completely integral at the time of application of succeeding coats. At the time of application of each successive coat, undercoats shall be cleaned of dust, grease, or foreign matter by means of airblast, solvent cleaning, or other suitable means. Cement and mortar deposits on painted steel surfaces, not satisfactorily removed by ordinary cleaning methods, shall be brush-off blast cleaned and completely repainted as required. Undercoats of high gloss shall, if necessary for establishment of good adhesion, be scuff sanded, solvent wiped or otherwise treated prior to application of a succeeding coat. Field coats on metal shall be applied after erection except as otherwise specified and except for surfaces to be painted that will become inaccessible after erection.

### 3.2.9 Contacting Surfaces

When riveted or ordinary bolted contact is to exist between surfaces of ferrous or other metal parts of substantially similar chemical composition, such surfaces will not be required to be painted but any resulting crevices shall subsequently be filled or sealed off with paint. Contacting metal surfaces formed by high-strength bolts in friction-type connections shall not be painted. Where a nonmetal surface is to be in riveted or bolted contact with a metal surface, the contacting surfaces of the metal shall be cleaned and given three coats of the specified primer. Unless otherwise specified, corrosion-resisting metal surfaces, including cladding therewith, shall not be painted.

### 3.2.10 Drying Time Prior to Immersion

Painted surfaces that are to be immersed in water shall be permitted a final drying time as long as practicable, but in any event the following minimum requirements shall be met. Coal tar-epoxy systems shall not be immersed until the final coat has dried at least 5 days. Minimum drying periods may be required to be increased up to twofold if the drying temperature is below 65 degrees F and/or if the immersion exposure involves considerable abrasion.

### 3.2.11 Protection of Painted Surfaces

Where shelter and/or heat are provided for painted surfaces during inclement weather, such protective measures shall be maintained until the paint film has dried, and discontinuance of the measures is authorized. Items that have been painted shall not be handled, worked on, or otherwise disturbed until the paint coat is fully dry and hard. All metalwork coated in the shop or field prior to final erection shall be stored out of contact with the ground in such manner and location as will minimize the formation of water-holding pockets, soiling, contamination, and deterioration of the paint film, and damaged areas of paint on such metalwork shall be cleaned and touched up without delay. The specified first overall field coat of paint shall be applied within a reasonable period after the shop coat and in any event before weathering of the shop coat becomes extensive.

### 3.2.12 Special Directions for Mixing and Applying Coal Tar Epoxy-Polyamide Black Paint (or Dark Red)

#### 3.2.12.1 Mixing

Component B shall be added to previously stirred component A and thoroughly mixed together with a heavy-duty mechanical stirrer just prior to use. The use of not more than 1 pint of xylene thinner per gallon of paint will be permitted in order to improve application properties and extend pot life. Where applicable, an approved thinner which complies with air pollution regulations shall be substituted for xylene. The pot life of the mixed paint, extended by permissible thinning, may vary from 2 hours in very warm weather to 5 or more hours in cool weather. Pot life in warm weather may be extended by: precooling the components prior to mixing; cooling the mixed material; and/or by slow, continuous stirring during the application period. The mixed material shall in any event be applied before unreasonable increases in viscosity take place.

#### 3.2.12.2 Application

Spray guns shall be of the conventional type equipped with a fluid tip of about 0.09-inch diameter and external atomization, 7-hole air cap. Material shall be supplied to the spray gun from a bottom withdrawal pot or by means of a fluid pump; hose shall be 1/2-inch in diameter. Atomization air pressure shall not be less than 80 p.s.i. High-pressure airless spray equipment may be used only on broad, simply configured surfaces. Brush application shall be carried out with a stiff-bristled tool heavily laden with material and wielded in a manner to spread out the coating smoothly and quickly without excessive brushing. The coverage rate of the material is approximately 110 square feet per gallon per coat to obtain 20 mils (dry thickness) in a 2-coat system. The minimum amount of paint applied in any coat shall be such that the deposited material flows together and provides a coherent, pin-hole-free film. To promote uniformity of thickness the direction of the spray passes (or finish strokes if brushed) of the second coat shall be at right angles to those of the first where practicable.

### 3.2.12.3 Subsequent Coats

Except at the high temperatures discussed below, the drying time between coal tar epoxy coats shall be not more than 72 hours, and application of a subsequent coat as soon as the undercoat is reasonably firm is strongly encouraged. Where temperature for substrate or coating surface during application or curing exceeds or can be expected to exceed 125 degrees F as the result of direct exposure to sunlight, either the surfaces shall be shaded by overhead cover or the interval between coats shall be reduced as may be found necessary to avoid poor intercoat adhesion, here defined as inability of two or more dried coats of coal tar epoxy paint to resist delamination when tested aggressively with a sharp knife. Under the most extreme conditions involving high ambient temperatures and sun-exposed surfaces, the drying time between coal tar epoxy coats shall not exceed 10 hours, and the reduction of this interval to a few hours or less is strongly encouraged. Where the curing time of a coal tar epoxy undercoat exceeds the above (i.e., 72 hours of curing at normal temperatures or 10 hours at extreme conditions), or where the undercoat develops a heavy blush, frequently caused by its being subjected to moisture soon after application, it shall be given one of the following treatments before the subsequent coat is applied:

(1) Etch the coating surface lightly by brush-off blasting, using fine sand, low air pressure and a nozzle-to-surface distance of approximately 3 feet.

(2) Remove the blush and/or soften the surface of the coating by wiping it with cloths dampened with 1-methyl-2-pyrrolidone solvent or with Bitumastic 2CB solvent marketed by the Koppers Company, Inc. The solvents may be applied to the surface by fog spraying followed by wiping, but any puddles of solvent must be mopped up immediately after they form. The subsequent coat shall be applied in not less than 15 minutes or more than 3 hours after the solvent treatment.

### 3.2.12.4 Ambient Temperature

Coal tar epoxy paint shall not be applied when the receiving surface or the ambient air is below 50 degrees F nor unless it can be reasonably anticipated that the average ambient temperature will be 50 degrees F or higher for the 5-day period subsequent to the application of any coat.

### 3.2.12.5 Safety

In addition to the safety provisions in paragraph 1.8 above, other workmen as well as painters shall take extra care to avoid inhaling atomized particles of coal tar epoxy paint and to avoid contact of the paint with the skin.

## 3.2.13 Special Directions for Mixing and Applying Epoxy Zinc-Rich Paint (Formula E-303d)

### 3.2.13.1 Mixing

Epoxy zinc-rich primer (Formula E-303d) is a three component paint which must be field mixed. The pot life of the mixed material, extended from time to time by the addition of small amounts of thinner, will normally be in excess of 24 hours but may be less in warm weather. It is packaged as a 2.85-gallon kit (mixed paint volume) consisting of 1 gallon of Component A, 1 gallon of Component B, and 50 pounds of zinc dust, Component C. To prepare this primer for application combine Components A and B and thoroughly mix. Then sift the zinc dust into this mixture while it is being vigorously agitated with a heavy duty power stirrer and continue the stirring until the zinc dust has been well dispersed and the mixture is smooth. The mixed paint shall at some point be strained through a 30-60 mesh screen to prevent undispersed zinc dust slugs from reaching the spray gun nozzle.

### 3.2.13.2 Thinning

When the ambient and/or steel temperatures are below about 80 degrees F, it will not normally require over 15 percent thinning; but in any event the paint shall at all times contain sufficient volatiles (thinners) to permit it to be satisfactorily atomized to provide a wet spray and avoid deposition of particles that are semi-dry when they reach the surface. Where thinning is required, either methyl ethyl ketone (MEK) or Alc-50 shall be used, with the latter preferred for general use.

### 3.2.13.3 Application

Conventional type (air atomization) spray equipment consisting of a paint pot with an agitator, 3/8-inch material hose, and a spray gun with an air cap, tip, and needle suitable for spraying lacquers and vinyl type paints is preferred for applying this paint; however, airless equipment may be approved for use provided that application results are satisfactory. The paint shall be stirred continuously during application at a rate that will prevent the zinc dust from settling.

When spraying is resumed after any interruption of longer than 15 minutes, the entire length of material hose shall be whipped vigorously until any settled zinc is redispersed. The hose shall be emptied whenever the painting operation is to be suspended for more than an hour. Epoxy zinc-rich paint (Formula E-303d) shall be spray applied, except that areas inaccessible to spraying shall be brushed. This paint shall not be applied when the temperature of the ambient air and the receiving surfaces is less than 50 degrees F. It shall be applied in not less than two single spray coats with no limitations as to the minimum drying time between coats, provided that recoating does not cause running and sagging.

Up to a maximum of 8 days drying time between coats will be permitted provided that the first coat is void-free, and of such thickness as to prevent rusting; the spray passes of the second coat shall be at right angles to those of the first coat where practicable. Each coat of E-303b paint shall consist of a preliminary, extra spray pass on edges, corners, interior angles, seams, crevices, junctions of joining members, rivets, weld lines and similar surface irregularities, followed by an overall single half-lapped spray coat applied at a coverage rate of approximately 350 square feet per gallon (based upon unthinned paint). Pits, cracks and crevices shall be filled with paint insofar as practicable, but in any event all pit surfaces shall be thoroughly covered and all cracks and crevices shall be sealed off against the entrance of moisture. Rivets, bolts and similar surface projections shall receive sprayed paint from every direction in order to insure complete coverage of all faces.

## 3.3 PAINT SYSTEMS TO BE APPLIED--NUMBER OF COATS AND FORMULAS

### 3.3.1 General

The required paint systems and the surfaces to which they shall be applied are shown in para. 3.3.2 below. Supplementary information follows:

#### 3.3.1.1 Fabricated and Assembled Items

Items that have been fabricated and/or assembled into essentially their final form and that are customarily cleaned and painted in accordance with the manufacturer's standard practice will be exempted from equivalent surface preparation and painting requirements described herein, provided that: (1) surfaces primed (only) in accordance with such standard practices are compatible with specified field-applied finish coats, (2) surfaces that have been primed and finish painted in accordance with the manufacturer's standard practice are of acceptable color and are capable of being satisfactorily touched up in the field, and (3) items expressly designated herein to be cleaned and painted in a specified manner are not coated in accordance with the manufacturer's standard practice if different from that specified herein.

#### 3.3.1.2 Colors and Tints

Colors and tints for the trash racks shall be gray color unless as directed by the Contracting Officer.

3.3.1.3 Surface Preparation

The method of surface preparation and pretreatment shown in the tabulation of paint systems is for identification purposes only. Cleaning and pretreatment of surfaces prior to painting shall be accomplished in accordance with detailed requirements hereinbefore described.

3.3.2 Paint Systems and Painting Schedule

See para. 3.3.3 below for supplementary application instructions pertaining to the following paint systems:

(1) SYSTEM NO. 1

Items or surfaces to be coated: Gypsum board and concrete masonry units shall be painted with a semigloss blue paint No. 25550.

Surface Preparation	Paint Formulas to be Applied		
	1st Coat	2nd Coat	3rd Coat
Brush off or vacuum	CID A-A-2994 Type II	CID A-A-2247	CID A-A-2247

(2) SYSTEM NO. 2

Items or surfaces to be coated: Exposed portions of steel sheet pilings.

SURFACE PREPARATION	1 <sup>ST</sup> COAT	2 <sup>ND</sup> COAT	3 <sup>RD</sup> COAT
Power tool or Brushoff blast cleaning	SSPC Paint 25 Type I	FS TT-P-38 (Aluminum)	FS TT-P-38 (Aluminum)

(3) SYSTEM NO. 6-A-Z

Items or surfaces to be coated: All surfaces of the pumps, intake pipes, pump bells, all ferrous nuts, bolts, and washers (below El. 324.0); (Coal tar epoxy-polyamide black paint shall conform to SSPC-Paint 16 manufactured with type 1 Pitch.)

Surface Preparation	Paint Formulas to be Applied			
	1st Coat	2nd Coat	3rd Coat	4th Coat
Approaching white metal blast cleaning	Epoxy Zinc-rich paint E-303d	Epoxy Zinc-rich paint E-303d	Coal tar epoxy-polyamide black	Coal tar epoxy-polyamide black

(4) SYSTEM NO. 12

Items or surfaces to be coated: Interior and exterior stairs, handrailing, access ladders, metal gratings, stoplog slot angles, and trash barriers.

<u>Surface Preparation</u>	<u>Paint Formulas to be Applied</u>
Suitable for galvanizing	Clean and treat in accordance with ASTM Spec. A 123 or other applicable specification. Touch damaged up cut edges and areas of galvanizing in the field with two coats of TT-P-1046, DOD-P-21035, MIL-P-26915 (USAF) or other approved zinc-rich paint.

(5) SYSTEM NO. 16

Items or surfaces to be coated; Gear reducers, engines, structural steel, doors and miscellaneous metals (above El. 324.0) shall be given two coats of silicone alkyd enamel paint after power tool or brush-off blast cleaning surfaces and priming all bare metal.

<u>Surface Preparation</u>	<u>Paint Formulas to be Applied</u>		
	<u>1st Coat</u>	<u>2nd Coat</u>	<u>3rd Coat</u>
Power tool or brush-off blast cleaning	SSPC-Paint No. 25	Fed. Spec. TT-E-490E	Fed. Spec. TT-E-490E

(6) SYSTEM NO. 17

Items or surfaces to be coated: Interior concrete, walls and ceiling of the equipment room and the concrete walls and the gypsum board walls and ceiling of the stair well to the equipment room shall be painted with semigloss white paint No. 27886.

<u>Surface Preparation</u>	<u>Paint Formulas to be Applied</u>	
	<u>1<sup>st</sup> Coat</u>	<u>2<sup>nd</sup> Coat</u>
As specified by the Contracting Officer for each Type of surface.	Fed. Spec. TT-P-29	Fed. Spec. TT-P-29

(7) GRAY EPOXY SYSTEM FOR FLOORS

Items or surfaces to be coated: Concrete floors in the equipment room and the floor of the stairwell to the equipment room, the office and lavatory floors and the concrete floor in the operating room.

Surface Preparation	<u>Paint Formulas to be Applied</u>	
	1 <sup>st</sup> Coat	2 <sup>nd</sup> Coat
Power tool or Brush-off blast cleaning	TT-C-535 with Ottawa sand abrasive admixture	TT-C-535

(8) EXPOSED STRUCTURAL STEEL SURFACES AND EXPOSED METAL SIDING SURFACES ON THE INTERIOR OF THE BUILDING

Wall surfaces and the ceiling surfaces and all supporting steel members shall be painted with a semi-gloss blue paint No. 25550.

3.3.3 Supplementary Application Instructions

Surfaces shall be coated with the system indicated in the schedule and/or as noted on the drawings in accordance with the following instructions:

3.3.3.1 System No. 1

All gypsum board and concrete masonry units shall be painted with a three coat paint system.

3.3.3.2 System No. 2

All exposed portions of steel sheet piling shall be painted with a three coat paint system.

3.3.3.3 System No. 6-A-Z

The epoxy zinc-rich paint shall be applied in not less than 2 single, half-lapped spray coats to an average dry film thickness of not less than 3.0 mils and a thickness of not less than 2.5 mils at any point. After a drying period of not less than six hours nor more than 96 hours for the second zinc-rich coat, at least two coats of coal tar epoxy paint shall be applied to provide a minimum thickness at any point of 16 mils for the coal tar epoxy system, 21 mils for the completed system. If the second coat of epoxy zinc-rich paint has been applied in the shop or otherwise has been permitted to cure for longer than 96 hours, it shall be completely recoated with an additional thin tack of the zinc-rich paint which in turn shall be overcoated within 96 hours with the first coat of coal tar epoxy. The specified film thicknesses above shall be attained in any event and any additional coats needed to do so shall be applied at no additional cost to the Government. See safety provisions and special directions for mixing and applying SSPC-16 coal tar epoxy and E-303d epoxy zinc-rich paints.

3.3.3.4 System No. 12

Clean and galvanize the new items as specified in the paint schedule after fabrication. Touch up mars and breaks in galvanized coating with two coats of TT-P-1046, Mil. Spec. DOD-P-21035, MIL-P-26915 (USAF), or other approved zinc-rich paint.

3.3.3.5 System No. 16

Finish color as required. No paint shall be applied to machine-finished surfaces. Pipe threading and cutting compounds

shall be removed by solvent washing prior to application of paint to pipe surfaces. The doors shall be painted the same color as specified in 3.3.2 (8).

#### 3.3.3.6 System No. 17

Allow new concrete and masonry surfaces to age and dry at least 30 days before painting with Fed. Spec. TT-P-29 paint. Except as otherwise required, metal ductwork, conduit, pipe, grilles, louvers, pull boxes, and exposed surfaces of miscellaneous embedded metalwork shall be finish painted the same as adjacent ceilings or walls. Prior to application of specified first coat of Fed. Spec. TT-P-29 paint, galvanized and other nonferrous metal surfaces shall be solvent cleaned and treated with Mil. Spec. MIL-P-15328 pretreatment.

#### 3.3.3.7 Gray Epoxy System for Floors

Allow new concrete surfaces to age and dry at least 30 days and 90 days as applicable before painting. Ottawa sand shall be mixed with the first coat at the rate of 2 pounds per gallon. Mixing and application shall be in accordance with the manufacturer's recommendations.

#### 3.3.3.8 Exposed Structural Steel Surfaces and Exposed Metal Siding Surfaces on the Interior of the Building

See paragraph 3.1.3.1 Ferrous surfaces in atmospheric exposure for preparation of surfaces for painting and paragraph 3.1.4 Galvanized aluminum alloy, or copper surfaces for specific directions for applying Mil. Spec MIL-P-15328 pretreatment.

### 3.4 ROLLUP DOOR AND EXTERIOR SURFACE OF OTHER OUTSIDE DOORS

Exterior surfaces of the roll-up door and the other outside doors shall be painted a color that matches the surface color of the building siding.

#### 3.4.1 Interior Surfaces of other Doors

Interior surfaces of all doors shall match the color of the walls that they face when in the closed position.

### 3.5 PROTECTION OF NON-PAINTED ITEMS AND CLEAN-UP

Walls, equipment, fixtures and all other items in the vicinity of the surfaces being painted shall be maintained free of damage by paint or painting activities. Prompt clean-up of any paint spillage and prompt repair of any painting activity damage shall be required.

-- End of Section --

DIVISION 10 - SPECIALTIES

SECTION 10800

TOILET ACCESSORIES

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DIVISION 10 – SPECIALTIES

SECTION 10800

TOILET ACCESSORIES

PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-2380 (Basic) Dispenser, Paper Towel

FEDERAL SPECIFICATIONS (FS)

FS DD-M-00411 (Rev B; Am 1) Mirrors, Glass

FS WW-D-1908 (Rev A) Dispenser, Toilet Paper, Cabinet

FS WW-P-541/GEN (Rev E) Plumbing Fixtures

FS WW-H-1911 (Rev A) Holder, Toilet Paper (Single Roll)

FS WW-P-541/8 (Rev B; Am 1) Plumbing Fixtures (Accessories, Land Use)

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 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Finishes; GA. Accessory Items; GA.

Manufacturer's descriptive data and catalog cuts indicating materials of construction, fasteners proposed for use for each type of wall construction, mounting instructions, and operation instructions.

SD-14 Samples

Finishes; GA. Accessory Items; GA.

One sample of each accessory proposed for use. Approved samples may be incorporated into the finished work, provided they are identified and their locations noted.

### 1.3 GENERAL REQUIREMENTS

Toilet accessories as specified herein shall be provided. Each accessory item shall be complete with the necessary mounting plates, anchors, and fasteners. Concealed mounting plates shall be sturdy construction with corrosion resistant surface.

#### 1.3.1 Anchors and Fasteners

Anchors and fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be well suited for use with the supporting construction. Where exposed fasteners are permitted, they shall have oval heads and finish to match the accessory.

## PART 2 PRODUCTS

### 2.1 FINISHES

Finishes on metal shall be provided as follows:

<u>Metal</u>	<u>Finish</u>
Stainless steel Carbon steel, copper alloy, and brass	No. 4 general-purpose Chromium plated, bright

### 2.2 ACCESSORY ITEMS

Accessory items shall conform to the respective specifications and other requirements specified below. All accessory items shall have a smooth finish.

#### 2.2.1 Mirror, Glass (MG)

Glass mirror shall conform to FS DD-M-00411, Class 2, Style C, 24" X 30".

#### 2.2.2 Paper Towel Dispenser (PTD)

Paper towel dispenser and waste receptacle, conforming to CID A-A-2380, shall be constructed of not less than 0.0269-inch stainless steel, shall be surface mounted, and shall dispense C-fold, single-fold, or quarter-fold towels. Capacity of

dispenser shall be at least 400 C-fold or 525 multi-fold towels. Surface mounted dispenser shall have a towel compartment. Locking mechanism shall be pushed button or twist-type lock. Waste receptacle shall have a stainless steel removable container.

#### 2.2.3 Soap Dispenser (SD)

Soap dispenser shall be liquid type consisting of a vertical stainless steel tank with holding capacity of 40 fluid ounces.

#### 2.2.4 Shelf, Metal, Light Duty (SMLD)

Light duty metal shelf shall conform to FS WW-P-541/GEN and FS WW-P-541/8, Type V. Shelf shall be supported between brackets or on brackets. Width and length shall be as directed by the Controlling Officer. Shelf and separate supports shall be stainless steel.

#### 2.2.5 Towel Bar (TB)

Towel bar shall conform to FS WW-H-1911, Type IV, Class 1, stainless steel; 24 inches long. Bar shall be minimum 3/4-inch diameter.

#### 2.2.6 Toilet Tissue Dispenser (TTD)

Toilet tissue holder shall conform to FS WW-H-1911, Type I, roller mounted on two support brackets. Bracket(s) shall be stainless steel. Toilet tissue cabinet shall conform to FS WW-D-1908, stainless steel containing 2 rolls of tissue.

#### 2.2.7 Coat Hooks

Hooks shall be bright polished stainless steel with 2" X 2" flange to conceal mounting bracket. Hooks shall be 1" wide X 6 1/4" high and project 3" from the wall. The coat hooks shall be located as directed by the Contracting Officer.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Toilet accessories shall be securely fastened to the supporting construction in accordance with the manufacturers recommendations. Accessories shall be protected from damage from the time of installation until acceptance.

#### 3.2 CABINET (DOUBLE SINK)

The Contractor shall submit shop drawings to the Contracting Officer for approval showing the design of the cabinet and type of surface and/or finish the top of the cabinet shall have and/or catalogue cuts or brochures. The cabinet shall be constructed of solid wood. High density particleboard may be used for the counter top with an integral back lip, with a formica glued on surface. All drawer pulls, door knobs and hinges shall be made of brass.

#### 3.3 OVERHEAD CABINETS

The Contractor shall submit shop drawings to the Contracting Officer for approval showing the design of the overhead

cabinets and/or catalogue cuts or brochures. The cabinet shall be constructed of solid wood. Particleboard material of any kind is not permitted in any part of the cabinets. All door pulls and hinges shall be made of brass.

--End of Section --

Invitation No. DACW66-99-B-0014

DIVISIONS 11 THRU 12 - NOT USED

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13202

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DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13202

FUEL OIL DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 SCOPE

The work includes furnishing labor, material, equipment, transportation, and supervision, to install two (2) 6,000 gallon capacity aboveground steel and concrete vaulted fuel oil storage tanks and all associated valves, piping and appurtenances.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with requirements and maintain records of his quality control for manufacturing and operations of the equipment including but not limited to the following:

- (1) Fabrication, welding, installation, and testing of the tanks and its accessories.
- (2) Inspection at the work site to assure use of specified materials and equipment.
- (3) Inspection on delivery of all supplies and materials.

1.3 APPLICABLE PUBLICATIONS

The following publication of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 6D (1991) Supple 1) Pipeline Valves (Gate, Plug, Ball, and Check Valves)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.20.1 (1983) Pipe Threads, General Purpose (Inch)  
ASME B16.3 (1985) Malleable Iron Threaded Fittings, Classes 150 and 300  
ASME B16.5 (1988) Errata; B16.5a) Pipe Flanges and Flanged Fittings  
ASME B16.9 (1993) Factory-Made Wrought Steel Buttwelding Fittings  
ASME B16.11 (1991) Forged Fittings, Socket Welding and Threaded  
ASME B16.21 (1992) Nonmetallic Flat Gaskets for Pipe Flanges  
ASME B31.1 (1992) Power Piping

ASME B31.3	Chemical Plant, and Petroleum Piping
ASME B36.10M	(1985) Welded and Seamless Wrought Steel Pipe
ASME BPV IX	(1992) Addenda Dec 1992) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

#### FEDERAL SPECIFICATIONS (FS)

FS L-C-530	(Rev C) Coating, Pipe, Thermoplastic Resin
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#### 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	(1988) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(1991) Pipe Hangers and Supports - Selection and Application

#### NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)

NACE RP0274	(1974) High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation
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#### NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1993) National Electrical Code
NFPA 30	(1993) National Electric Code

#### STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP 6	(1991) Commercial Blast Cleaning
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#### UNDERWRITERS LABORATORIES (UL)

UL-06	(1992; Supple) Gas and Oil Equipment Directory
UL-142	(1994) Steel Aboveground Tanks for Flammable and Combustible Liquids
UL-2085	(1994) Insulated Aboveground Tanks for Flammable and Combustible Liquids

## 1.4 GENERAL REQUIREMENTS

### 1.4.1 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 BPV IX. 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.

### 1.4.2 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. Valves, flanges and fittings shall be marked in accordance with MSS SP-25.

### 1.4.3 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.

### 1.4.4 Licensing

The Contractor shall be appropriately licensed by the State of Missouri to install Above Ground Diesel Storage Tanks.

### 1.4.5 State Agency Notification

The Missouri Department of Pollution Control and Ecology and the Missouri State Fire Marshall's Office shall be notified at least five (5) days prior to commencement of installation of new tanks.

### 1.4.6 Registration

Registration of the new tanks with the Missouri Department of Pollution Control and Ecology will be the responsibility of the Government.

## 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 01330 – SUBMITTAL PROCEDURES:

### Drawings

Fuel Oil Piping System; GA.

Drawings showing location, size and all branches of pipeline; location of all required shutoff valves and accessories; and instructions necessary for the installation of connectors and supports.

## PART 2 PRODUCTS

### 2.1 VAULTED ABOVEGROUND FUEL OIL STORAGE TANKS

#### 2.1.1 General

The vaulted aboveground fuel oil storage tanks shall be purchased by the Contractor through the New Item Program (NIP) of the General Services Administration (GSA) or from any source providing that the specifications are met and a certificate is submitted to the Contracting Officer certifying that the tanks meet the specifications.

#### 2.1.2 Primary Tank

The primary tank shall be rectangular in shape and have continuous welds on all sides, inside as well as outside conforming with the American Welding Society for continuous weld. The primary tank shall be minimum 0.125 inch thick carbon steel listed per U.L. Standard 142. The tank shall be warranted for 30 years by the manufacturer.

#### 2.1.3 Concrete Encasement

The concrete encasement shall be 6 inches thick lightweight concrete. The concrete design shall include the following for long term durability: air entrapment, water-reducing admixture, fiber mesh reinforcement, and steel reinforcement. Vault shall be of concrete exterior and of a continuous and visually verifiable monolithic pour on top, bottom and sides of steel tank and contain no cold joints or heat sinks on bottom and sides. The steel tank shall be pressurized at 5 psi during concrete encasement.

#### 2.1.4 Fire Resistance

The tank system shall be designed and tested to provide 2-hour fire protection for the primary tank. No steel members shall penetrate the walls or floor of the concrete encasement to assure isolation from pool fire heat. The fire resistance of the tank shall be tested in accordance with the procedure established in U.L. 2085.

#### 2.1.5 Thermal and Corrosion Protection

The tank construction shall include thermal insulation to protect against temperature extremes and corrosion by isolating the steel tank from the concrete. No steel or insulating spacer panels in the unit shall come in direct contact with concrete or any other corrosive material.

#### 2.1.6 Secondary Containment with Leak Monitoring

The tank system shall include an impervious barrier of 30 mil high-density polyethylene to contain leaks from the primary tank. A leak detection access tube shall be located between the inner tank and secondary barrier. In the event of a leak, a positive space shall be available to permit leaked fluid to flow to the detection tube.

#### 2.1.7 Overfill Protection

Overfill protection shall be provided by a direct reading level gauge located on top of tank in addition to an audible high level alarm activated by a fuel oil level sensor set at the 95% full level.

#### 2.1.8 Exterior Finish

The tank system shall have a coated concrete exterior to resist weather, reflect sunlight and inhibit corrosion.

#### 2.1.9 Venting

Tank shall be provided with 18" manhole and an 8" emergency vent and a 2" by 8 foot vent riser with rain-tight vent cap. Venting shall conform to fire codes and U.L./U.L.C. Standards.

#### 2.1.10 Support Legs

Vaults shall have concrete support legs of unitized monolithic construction to provide visual inspection capability.

#### 2.1.11 Fuel Oil Level Gauge

Tank shall be furnished with 8", vertical face, liquid-level gauge with direct reading dial and float operated, geared movement. Level gauge shall be Model DR-1 as manufactured by Pneumercator Co., 120 Finn Court, Farmingdale, NY, or approved equal.

#### 2.1.12 Single Check Foot Valve

Tank shall be furnished with 2" single poppet foot valve located 1" above bottom of tank. Foot valve shall be cadmium plated cast iron with bronze poppet and seats. Foot valve shall have 20-mesh monel screen.

#### 2.1.13 Fill Tube

Tank shall have 3" steel fill tube. Bottom of fill tube shall be located 4" off bottom of tank with the end slanted at 45 degrees.

### 2.2 FILL STATION

Fill station shall have 3" quick disconnect coupling for tanker truck connection and a 3" discharge connection. Fill station shall come equipped with check valve, shut-off valve, and spill containment. Spill containment system shall have drain valve, bucket for drain collection, and a hand pump with check valve for pumping spill back into outlet pipe. Fill station shall be installed inside steel enclosure with access doors, to fill coupling compartment and drain compartment. The Contractor shall submit shop drawings for approval to the Contracting Officer.

### 2.3 HIGH LEVEL ALARM SYSTEM

A high-level alarm system shall be installed as indicated on contract drawings. Each tank shall be equipped with a high-level alarm sensor set at 95% of tank capacity. A three-point alarm console shall be furnished and installed as indicated on drawings. Alarm console shall be housed in a NEMA 4 watertight enclosure. Alarm console shall have high level warning lights and audible alarm with reset button. Alarm console shall be powered by 120 volts, single phase. Each alarm channel shall be separate and independent with its own tank mounted level sensor. Electronic level sensors shall be optic or thermistor types and shall be intrinsically safe for hazardous environments. Magnetic floats, displacement floats or add-ons to gauging systems are not acceptable. The tank level alarm system shall be UL and FM approved. The alarm system shall be a Scully ST-15-115WXB or approved equal.

### 2.4 PIPE AND FITTINGS

#### 2.4.1 Steel Pipe, Joints, and Fittings

Steel pipe shall conform to ASME B36.10M. Malleable-iron threaded fittings shall conform to ASME B16.3. Steel pipe flanges and flanged fittings including bolts, nuts, and bolt pattern shall be in accordance with ASME B16.5. Wrought steel butt welding fittings shall conform to ASME B16.9. Socket welding and threaded forged steel fittings shall conform to ASME B16.11.

#### 2.4.2 Sealants for Steel Pipe Threaded Joints

Joint sealing compound shall be listed in UL-06, Class 20 or less. Tetrafluoroethylene tape shall conform to UL-06.

#### 2.4.3 Identification

Pipe flow markings and metal tags shall be provided as required.

#### 2.4.4 Flange Gaskets

Gaskets shall be non-asbestos compressed materials in accordance with ASME B16.21, 1/16-inch thickness, full face or self-centering flat ring type. The gaskets shall contain aramid fibers bonded with nitrile butadiene rubber (NBR) suitable for a maximum 600 degree F service.

#### 2.4.5 Pipe Threads

Pipe threads shall conform to ASME B1.20.1.

### 2.5 OVERFLOW TANK AND PUMP

#### 2.5.1 Overflow Tank

A 100 gallon diesel fuel overflow tank shall be furnished and installed at the location as shown on contract drawings. The overflow tank shall be welded steel construction of less than 11 gage (1/8-inch) steel and shall be built in accordance with applicable requirements of NFPA Standard No. 30 for aboveground atmospheric tanks. The tank shall be epoxy painted inside and be rustproofed and finish painted outside in accordance with the manufacturer's recommendation. A motor controller with float switch shall be furnished on the tank and shall operate the discharge pump at a differential of not less than 75 percent of tank capacity.

#### 2.5.2 Discharge Pump

A discharge pump shall be furnished and installed on top of the overflow tank. The discharge pump shall be electrically driven, positive displacement rotary type, mechanical seals, built-in relief valve, bronze or cast iron body, steel or bronze gears and shafts. The bearing shall be of a material which will not be damaged by continuous contact with the fuel oil. The pump shall have a minimum suction lift of twenty feet with a minimum delivery rate of 5 gallons per minute while pumping Grade No. 2-D diesel fuel, with a viscosity of 100 SSU at operating pressure of 50 psi.

### 2.6 VALVES

Valves shall be suitable for shutoff or isolation service and shall conform to the following:

#### 2.6.1 Ball Valves

Ball valves shall be bronze with cadmium plated ball and reinforced TFE stuffing box ring and virgin TFE seats. Handle shall be zinc plated steel with vinyl grip. Ball valves shall conform to API Spec 6D, Class 150.

#### 2.6.2 Gate Valves

Gate valves shall be bronze, rising stem, double wedge disc, conforming to API Spec 6D, Class 150.

### 2.7 PIPE HANGERS AND SUPPORTS

Pipe hangers and supports shall conform to MSS SP-58 and MSS SP-69.

### 2.8 P1000 UNISTRUT

P1000 unistruts shall be stainless steel and installed with stainless steel anchor bolts as indicated on the drawings.

### 2.9 NON-SHRINK NON-METALLIC GROUT

The Contractor shall furnish certificates stating that the grout is non-shrink and non-metallic and that it will be satisfactory when used in the manner as indicated on the drawings.

## PART 3 EXECUTION

### 3.1 VAULTED TANK SYSTEM

#### 3.1.1 Installation

The tank system including accessories shall be installed in strict accordance with the manufacturer's recommendations and applicable fire and environmental codes.

#### 3.1.2 Marking

Tanks shall be marked on all sides with warning signs: "FLAMMABLE", "NO SMOKING", and product identification.

#### 3.1.3 Electrical Work

Electrical work shall be in accordance with the National Electric Code and shall be rated for hazardous area as required.

#### 3.1.4 Earthquake Restraints

Earthquake restraints designed for zone 3 loading have already been incorporated.

#### 3.1.5 Fabrication

Tank and concrete vault shall be shop-fabricated as one unit at the factory and shipped to the site.

### 3.2 FUEL OIL PIPING

The fuel oil piping system shall include all new fuel oil piping as shown on drawings.

#### 3.2.1 Protection of Materials and Components

Pipe openings shall be closed with caps or plugs during installation. Equipment shall be protected from dirt, water, and chemical or mechanical damage. At the completion of all work, the entire system shall be thoroughly cleaned.

#### 3.2.2 Workmanship and Defects

Piping and fittings shall be clear and free of cutting burrs and defects in structure or threading and shall be thoroughly brushed, chipped, and cleaned. Defects in piping or fittings shall not be repaired. When defective piping or fittings are located in a system, the defective material shall be replaced.

### 3.3 PROTECTIVE COVERING

#### 3.3.1 Protective Covering for Underground Steel Pipe

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.

#### 3.3.1.1 Thermoplastic Resin Coating System

The coating system shall conform to FS L-C-530, Part (3). The exterior of the pipe shall be cleaned to a commercial grade blast cleaning finish in accordance with SSPC SP 6. Adhesive compound shall be applied to the pipe. Immediately after the adhesive is applied, a seamless tube of polyethylene shall be extruded over the adhesive to produce a bonded seamless coating. The nominal thickness of the pipe coating system shall be 10 mils (plus or minus 10 percent) of adhesive and 40 mils (plus or minus 10 percent) of polyethylene for pipes up to 16 inches in diameter. Joint coating and field repair material shall be applied as recommended by the coating manufacturer and shall be one of the following:

- a. Heat shrinkable polyethylene sleeves.
- b. Polyvinyl chloride pressure-sensitive adhesive tape.
- c. High density polyethylene/bituminous rubber compound tape.

The coating system shall be inspected for holes, voids, cracks, and other damage during installation.

#### 3.3.1.2 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 set at a value in accordance with NACE RP0274 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. The Contracting Officer reserves the right to inspect and determine the suitability of the detector. Labor, materials, and equipment necessary for conducting the inspection shall be furnished by the Contractor.

### 3.3.2 Painting

#### 3.3.2.1 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.

#### 3.3.2.2 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.

#### 3.3.2.3 Toxic Compounds

Toxic compounds having ineffective physiological properties, such as order or irritation levels, shall not be used unless approved by the Contracting Officer.

#### 3.3.2.4 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 of and maintenance of such equipment.

### 3.3.2.5 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.

### 3.3.3 Protective Covering for Aboveground Piping Systems

Finish Painting shall conform to the following:

#### 3.3.3.1 Ferrous Surfaces

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 mill scale, and other foreign substances shall be mechanically cleaned by power wire brushing or commercial sandblasted and primed with ferrous metal primer. Primed surface shall be finished with two coats of exterior oil paint.

#### 3.3.3.2 Nonferrous Surfaces

Nonferrous surfaces shall not be painted.

## 3.4 INSTALLATION

Pipe shall be cut without damaging the pipe. Unless otherwise authorized, cutting shall be done by an approved type of mechanical cutter. Wheel cutters shall be used where practicable.

### 3.4.1 Installing Pipe Underground

Joints in steel pipe shall be welded except as otherwise permitted for installation of valves. Service lines shall have 18-inch minimum cover, and shall be placed on firmly compacted select material for the full length. Trench shall be excavated below pipe grade, bedded with bank sand, and compacted to provide full-length bearing. Laying the pipe on blocks to produce uniform grade will not be permitted. The pipe shall be clean inside before it is lowered into the trench and shall be kept free of water, soil, and all other foreign matter that might damage or obstruct the operation of the valves, regulators, meters, or other equipment. When work is not in progress, open ends of pipe or fittings shall be securely closed by expandable plugs or other suitable means. Minor changes in line or gradient of pipe that can be accomplished through the natural flexibility of the pipe material without producing permanent deformation and without overstressing joints may be made when approved. Changes in line or gradient that exceed the limitations specified shall be made with fittings.

### 3.4.2 Installing Pipe Aboveground

Aboveground piping shall be protected against dirt and other foreign matter as specified for underground piping. Joints in steel pipe shall be welded; however joints in pipe 3 inches in diameter and smaller may be threaded; joints may also be threaded to accommodate the installation of valves. Flanges shall be of the weld neck type to match wall thickness of pipe.

### 3.4.3 Aboveground Piping

Aboveground piping shall be run as straight as practicable along the alignment indicated and with a minimum of joints. Piping shall be separately supported.

## 3.5 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.

### 3.5.1 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 fuel oil service or tetrafluoroethylene tape applied to the male threads only. Threaded joints up to 1-1/2 inches in diameter may be made with approved tetrafluoroethylene tape. Threaded joints above 1-1/2 inches in diameter may be made with approved joint sealing compound. 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.

### 3.5.2 Welded Metallic Joints

Beveling, alignment, heat treatment, and inspection of welds shall conform to ASME B31.3. 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.

## 3.6 ELECTRICAL BONDING AND GROUNDING

Fuel oil piping and tanks shall be electrically continuous and bonded to a grounding electrode as required by NFPA 70.

## 3.7 TESTING

Before any section of a fuel oil distribution system is put into service, it shall be carefully tested to assure that it is liquid tight. Prior to testing, the system shall be blown out, cleaned and cleared of all foreign material. Testing shall be completed before any work is coated, covered, enclosed, or concealed. All testing of piping systems shall be done prior to application of coating with due regard for the safety of employees and the public during the test.

### 3.7.1 Pressure Tests

All new piping shall be subjected to a pressure test for at least 10 minutes, of at least 150 percent of the maximum expected working pressure at which the system is intended to operate, but in no case less than 50 psi. The Contractor shall furnish all materials, supplies, labor, and equipment required to perform the tests. The Contractor shall conduct the tests in such a manner that any gages, pressure switches, or other appurtenances will not be damaged. All taps or outlets used for connection of test pump and gages shall be securely plugged or capped after completion of the tests. All joint leaks or defective work disclosed prior to final acceptance by the Government, shall be corrected by the Contractor. All tests shall be made in the presence of the Contracting Officer, unless waived in writing.

-- End of Section --

DIVISION 14 – CONVEYING SYSTEMS

SECTION 14330

OVERHEAD CRANE

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DIVISION 14 – CONVEYING SYSTEMS

SECTION 14330

OVERHEAD CRANE

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, equipment and materials, and performing all operations necessary for installation of an overhead crane in the pumping station.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including, but not limited to the following:

- (1) Materials

Suitability, compliance with contract requirements.

- (2) Installation

Location, workmanship, conformance to contract requirements, tests.

- (3) Shop Drawings

Timely submittal and accuracy.

1.3 APPLICABLE PUBLICATIONS

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)

CMAA 70 (1988) Overhead Traveling Cranes

1.4 GENERAL REQUIREMENTS

The Contractor shall furnish, install and test one (1) overhead traveling crane. The overhead crane shall consist of bridge, trolley hoist, and all necessary accessories and appurtenances. The overhead crane shall be operated from the operating floor through a system of chains, sprockets and gears, installed as shown on the contract drawings and/or specified herein, have a capacity of eight (8) tons and intended for light duty and infrequent use. Adequate lubrication shall be provided for all moving parts of the bridge and trolley hoist. Materials shall be of the best grade and suitable for the purpose intended. The overhead traveling crane shall conform to the requirements of CMAA 70 Class A. Service requirements are for operation in an indoor environment.

## 1.5 SUBMITTALS

The Contractor shall submit to the Contraction Officer the following data and shop drawings for the overhead crane he proposes to furnish. Government approval is required for all submittals with a “GA” designation; submittals having an “FIO” designation are for information only.

- (1) Complete shop drawings of the bridge, trolley hoist, and assembly drawings of the complete crane; GA.
- (2) Any additional drawings covering crane installation and dismantling; GA.
- (3) Literature, catalog cuts and similar information, all numbered to agree with the list shown on the shop and assembly drawings of the crane, describing components, auxiliaries and accessories purchased by the crane manufacturer from other manufacturers; GA.
- (4) Ten copies of the crane operation and maintenance manuals; FIO.

## 1.6 DELIVERY AND STORAGE

Equipment delivered shall be placed in indoor storage, protected from the weather, humidity and temperature variations, dirt and dust, or other conditions.

## PART 2 PARTS

### 2.1 BRIDGE

The bridge shall be the top running, single girder type. The bridge shall be securely mounted into end trucks located at both ends of the bridge. The bridge end trucks shall be heavy steel channel box section weldments equipped with rail sweeps. Each bridge end truck shall have two wheels which shall be flame hardened, double flanged, with tapered tread. The wheels shall rotate on permanently lubricated ball bearings designed to withstand high radial and thrust loads. Maximum wheel loads shall be less than 10,000 pounds. The wheel axles shall be the fixed type made of high carbon steel. The bridge structure shall be made of heavy section American Standard I-beam rigidly welded to each end truck assembly. The bridge span shall be seventeen (17) feet – six (6) inches. The bridge beam shall be of sufficient size and strength to safely carry all of the loads imposed upon it when the crane is working under rated load. The bridge end trucks shall operate on not lighter than forty (40) pound per yard American Society of Civil Engineers (ASCE) crane rails. The crane rails shall be supported by wide flange beams as shown on the contract drawings. Suitable stops shall be provided to limit the travel of the bridge. The bridge drive shall consist of a steel shaft running the entire length of the bridge wupported at suitable intervals by roller bearings. Each end of this shaft shall be connected to driver pinions using a bolted coupling. The driver pinion gear shall be cut from heat treated alloy steel and shall mesh with an integral gear on one of the wheels on each end truck. The chain used for the bridge drive shall be cadmium plated to protect it against corrosion. All gears shall be machine cut. The bridge shall supply service to within six (6) feet – three (3) inches of the side building wall on the office end of the building and four (4) feet – nine (9) inches of the side building wall on the opposite side.

### 2.2 TROLLEY HOIST

The trolley hoist shall be built and designed to operate on the bridge beam specified above. The trolley hoist shall be the hand operated type. The trolley wheels shall be forged steel and have flame hardened, crowned treads and two (2) sealed ball bearings. The hoist frame and covers shall be made from aluminum castings. The hoist shall use roller bearings throughout. All gear and shaft connections shall be made by means of splines. The hoist shall be equipped with an automatic load brake. The load brake shall be the type which incorporates a heat treated ratchet wheel. The load brake shall rotate on large roller bearings for smooth lowering operation and to feduce the pull needed to lower loads. The hoist shall be designed for true vertical reeving. The hoist shall have a chain compartment which will

receive the idle load chain when lifting a load to prevent the chain from marring the surface of the load. The chain used on the trolley hoist shall be cadmium plated to protect it against corrosion. The load hook shall be the safety type and shall swivel freely. The load hook shall be capable of a twenty-five (25) foot lift. The trolley hoist after installation shall have a minimum hook height of 12 feet above the operating floor. The trolley hoist shall supply service to within three (3) feet of the centerlines of the crane rails. Suitable stops shall be installed to limit the travel of the trolley hoist.

### 2.3 SIGNS

A metal plate or sign showing the rated capacity of the traveling crane and displaying the words "CAUTION – DO NOT LIFT PUMP AND GEAR REDUCER AS A UNIT" shall be securely attached to the crane in a conspicuous place. Its location and the size of the lettering shall render the sign easily legible from the operating floor. The crane manufacturer may supply and attach to the crane a nameplate showing his name and address and the trade name of his product. A drawing, showing the size and location of the proposed signs, shall be submitted for approval.

## PART 3 EXECUTION

### 3.1 ERECTION

Erection shall be in accordance with the manufacturer' s instructions and as indicated.

### 3.2 TESTS

The overhead crane shall be tested by the Contractor as soon as practicable after installation. The crane shall be tested prior to its use. The crane shall be operated through all its functions with a test load of at least 125 percent of rated load. The functions to be tested are: (1) hoisting and lowering, (2) trolley hoist travel, (3) bridge travel, and (4) locking and safety devices. The Contractor shall provide all test loads. At no additional cost to the Government, the Contractor shall correct all defects disclosed by the tests. When the tests have been successfully completed, the crane will be accepted.

-- End of Section --

DIVISION 15 - MECHANICAL

SECTION 15160

VERTICAL MIXED FLOW PUMPS

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- 2.11 GUARDS AND COVERS
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- PART 3 EXECUTION
  - 3.1 INSTALLATION
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    - 3.2.1 Dry Tests
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DIVISION 15 – MECHANICAL  
SECTION 15160  
VERTICAL MIXED FLOW PUMPS

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all plant, labor, materials and equipment and performing all operations required to furnish, deliver, store, as necessary, install and test two identical vertical mixed-flow, impeller-type pumps, complete with all accessories and appurtenances; all as indicated on the contract drawings and specified herein.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for work specified in this section to assure compliance with requirements and maintain records of quality control for the manufacturing and operations of the equipment including but not limited to the following:

(1) Erecting Engineer

The Contractor shall provide the services for qualified Erecting Engineer to inspect the installation and perform field-testing of the pumps.

(2) Inspection

Inspection on delivery of all supplies and materials.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

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.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

ASA S2.19	(1989) Mechanical Vibrations – Balance Quality Requirements of Rigid Rotors, Part 1: Determination of Permissible Residual Unbalance
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 27	(1991) Steel Castings, Carbon, for General Applications
ASTM A 36	(1991) Structural Steel
ASTM A 48	(1992) Gray Iron Castings

ASTM A 108	(1990a) Steel Bars, Carbon, Cold Finished, Standard Quality
ASTM A 276	(1992) Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A 285	(1990) Pressure Vessel Plates, Carbon Steel, Low- and Intermediate-Tensile Strength
ASTM A 297	(1989) Steel Casting, Iron-Chromium and Iron-Chromium-Nickel, Heat Resistant, for General Application
ASTM A 312	(1992) Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A 516	(1990) Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
ASTM A 576	(1990b) Steel Bars, Carbon, Hot-Wrought, Special Quality
ASTM A 668	(1991) Steel Forging, Carbon and Alloy, for General Industrial Use
ASTM B 148	(1992a) Aluminum-Bronze Sand Castings
ASTM B 584	(1991a) Copper Alloy Sand Castings for General Applications
ASTM D 2000	(1990) Rubber Products in Automotive Applications
ASTM E 709	(1991) Magnetic Particle Examination

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME-16	(1992) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 Basic Coverage
ASME-17	(1992) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
ASME B4.1	(1967; R 1987) Preferred Limits and Fits for Cylindrical Parts
ASME B16.5	(1988) Pipe Flanges and Flanged Fittings
ASME B46.1	(1985) Surface Texture (Surface Roughness, Waviness, and Lay)
ASME B106.1M	(1985) Design of Transmission Shafting (Second Printing)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(1992) Structural Welding Code-Steel
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AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C200	(1986) Steel Water Pipe 6 In. and Larger
AWWA C203	(1991) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA C207	(1986) Steel Pipe Flanges for Waterworks Service - Sizes 4 in. Through 144 in.

AWWA C208	(1983; R 1989) Dimensions for Fabricated Steel Water Pipe Fittings
	HYDRAULIC INSTITUTE (HI)
HI-01	(1983) Standards for Centrifugal, Rotary & Reciprocating Pumps
	INSTRUMENT SOCIETY OF AMERICA (ISA)
ISA RP2.1	(1985) Manometer Tables

## 1.4 SYSTEM DESCRIPTION

### 1.4.1 Design Requirements

- a. Pumps shall be driven by the horizontal crankshaft diesel engines described in Section 15165 DIESEL ENGINE PUMP DRIVES through right angle, vertical shaft, reducers described in Section 15170 RIGHT ANGLE GEAR REDUCERS. System loss curve, which includes friction losses from pump discharge elbow to end of discharge line, including bend losses, exit loss, and velocity head, is included as Figure 1 at end of this section to permit determination of total head.
- b. Pump will be used to pump drainage water from the relief wells and from the Big Lake Drainage Area. The water will be relative turbid and may contain some sand, silt, and vegetative trash capable of passing the trash racks. The water temperature will not exceed 85 degrees F.

### 1.4.2 Performance Requirements

- a. Maximum level of vibrations of assembled pumping unit, consisting of pump, gear reducer, and engine, when tested in the dry as specified in paragraph FIELD TEST, subparagraph DRY TEST, shall not be greater than the value of lower limit of the “good” range of “General Machinery Vibration Severity Chart”. Make measurements at pump operating speed. “General Machinery Vibration Severity Chart” may be obtained from IRD Mechanalysis Inc., 6150 Huntly Rd., Columbus, Ohio 43229.
- b. Pump shall be capable of operation without instability over the entire range of heads specified in paragraph 1.4.3. Instability is defined, for this specification, as when one or more of the following conditions occur: pump has two or more flow rates at the same total head; head-capacity curve has a dip (region on curve where change in flow rate produces an abnormally low head); when any point in usable range of head-capacity curve cannot be repeated within 5 percent; when a test point deviates from normal curve by 10 percent.

### 1.4.3 Capacities

The pump shall be able to meet each of the following conditions:

- a. Condition No. 1: At a sump level of EL.308.0 and static head of 27.8 feet, the pump design capacity shall be not less than 75 cfs.
- b. Condition No.2: The pump shall be capable of operating against a static head of 0.0 feet with a sump level of EL. 309.75.
- c. Condition No. 3: The pump shall be capable of pumping not less than 50 cfs against a static head of 31.75 ft.

## 1.5 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### a. Data:

Lists of Materials; FIO.

Furnish two copies of purchase orders, mill orders, shop orders for materials, and work orders, including orders placed or extended by each supplier. Contractor shall at time of submittal of drawings furnish list designating materials to be used for each item.

Materials; FIO.

Furnish, within 90 days of notice of award, names of manufacturers of machinery and other equipment which Contractor contemplates incorporating in the work, together with performance capacities and other relevant information pertaining to the equipment.

Spare Parts; FIO

Furnish 10 copies of manufacturer's complete parts list showing all parts and spare parts and bulletins for pump. Clearly show all details and parts, and adequately describe parts or have proper identification marks.

Torsional Analysis; FIO.

Submit detailed analysis report.

### b. Drawings:

Drawings; GA.

Within 90 days of notice of award of contract, submit drawings listed below. Submit drawings of sufficient size to be easily read. Submit information in the English language. Dimensions shall be in English.

- (1) Outline drawings of pump showing pertinent dimensions and weight of each component of the pump.
- (2) Drawing showing details and dimensions of pump mounting design or layout including any embedded items (and the FSI).
- (3) Cross-sectional drawings of pump showing each component. Show major or complicated sections of pump in detail. Indicate on each drawing an itemized list of components showing type, grade, and class of material used and make and model number of standard component used.
- (4) Detail and assembly drawings required for manufacturing showing dimensions, tolerances, and clearances of shafts, sleeve journals, bearings, including dimensions of grooving, couplings, and packing gland, and diameter and tip clearance of propeller.
- (5) Detail and assembly drawings of entire pump. Include all dimensions required to manufacture pump.

- (6) Drawings covering erection and installation, which Contractor intends to furnish to erecting engineer.

c. Instructions:

Installation and Erection Instructions Manual; GA.

No later than time of pump delivery, furnish three copies of typed or printed, and bound, manual describing procedures to be followed by erecting engineer in erecting, assembling, installing, and dry-and wet-testing pump. To the extent necessary or desirable, coordinate and consolidate description of pump with similar descriptions specified for gear reducer and diesel engine. Description shall be complete, orderly, step-by-step explanation of operations required, and shall also include such things as alignment procedures, bolt torque values, permissible blade/bowl clearances; permissible bowl out-of-roundness; permissible shaft misalignment; recommended instrument setups; recommended gages and instruments; bearing clearances; and similar details. Description shall be complemented and supplemented by drawings, sketches, photos, and similar materials to whatever extent necessary or desirable, and the overall result shall be a description that may be comprehended by an engineer or mechanic without extensive experience in erecting or installing pumps of this type.

Changes In Installation and Erections Manual; GA

Contracting Officer will make changes or modifications as deemed necessary or desirable in the manual, and return one copy to Contractor. Differences of opinion shall be reconciled in a manner mutually agreeable to Contractor and Government, and five copies of the corrected manual shall be furnished to Government. Erecting engineer shall follow these instructions when erecting or installing pumps. Deviation shall be permissible only when agreed to in advance by the Contractor and Government.

d. Statements:

Factory Test Setup and Procedures; GA

The Contractor shall, prior to proceeding with the construction of the model, but not later than 90 days after the date of notice to proceed, submit to the Contracting Officer for approval a description of the proposed model and test procedure. Included therein shall be dimensioned drawings and cross-sectional views of the model pump showing with the location of all instruments and the point of their connection to the model.

Castings and Casting Repairs; GA.

The Contractor shall submit criteria for acceptance of castings and casting repairs, including welding procedure for each material used, to Contracting Officer for approval within 60 days of date of notice to proceed.

e. Samples:

Materials; GA.

Submit samples of materials as directed. Equipment, materials, and articles installed or used without the approval of the Contracting Officer shall be at risk of subsequent rejection.

f. Operation and maintenance Manuals:

Operating and Maintenance Instructions; FIO.

Furnish 10 copies of manual containing complete information on operation, lubrication, adjustment, routine and special maintenance, disassembly, repair, reassemble, and trouble diagnostics of pump and auxiliary units. Operation and maintenance manual and parts lists shall be bound separately, shall be approximately 8-1/2 inches by 11 inches, printed on good quality paper and bound between flexible, durable covers. Drawings incorporated in manual or parts lists, may be reduced to page size provided they are clear and legible, or may be folded into the manual to page size. Photographs or catalog cuts of components may be included for identification.

## 1.6 QUALIFICATIONS

Welding operators, welders, and tack welders shall be qualified and, as necessary, requalified for the particular type of work. Qualification shall be in accordance with one of the following codes: Part III, Section 5 of AWS D1.1; or Section IX of ASME-17. Contractor shall certify by name to Contracting Officer the welders and welding operators so qualified, including date of qualification, code, and procedures under which each qualified. Prior qualification may be accepted provided the welder has performed satisfactory work under the code for which he qualified within the preceding three months. Contractor shall require welder or welding operator to repeat qualifying tests when, in the opinion of Contracting Officer, work indicates reasonable doubt as to welder's proficiency. In such cases, welder shall be recertified as required above. The welder shall be considered disqualified until successful completion of retest. All expenses in connection with qualification and requalification shall be borne by Contractor.

## 1.7 ERECTION ENGINEER(S)

Furnish one or more competent erecting engineers fluent in English language who is knowledgeable about the installation of the vertical pumps and associated drive machinery. Erecting engineers provided by this section shall include those from Contractor's suppliers. When so requested, erecting engineers shall provide and be responsible for providing complete and correct direction during initial starting and subsequent operation of equipment until field tests are completed. Erecting engineer shall initiate instructions for actions necessary for proper receipt, inspection, handling, uncrating, assembly, and testing of equipment including instructions required to ensure compliance with paragraph REGULATORY REQUIREMENTS, EM 385-1-1. The Erecting Engineer(s) shall also keep a record of measurements taken during erection, and shall furnish one copy to Contracting Officer on request or on completion of installation of assembly or part. Erecting engineer shall instruct Contracting Officer in operation and maintenance features of work.

## 1.8 MAINTENANCE

### 1.8.1 Special Tools

Furnish one set of all "special tools" required to completely assemble, disassemble, or maintain pump. "Special tools" refer to grossly oversized or specially dimensioned tools, special attachment or fixtures, or any similar items. If required, provide a device for temporarily supporting pump shaft and impeller during assembly, disassembly, and reassemble of gear reducer when thrust bearing is not in place. Lifting devices required for use in conjunction with overhead crane shall be furnished. Provide portable steel cabinet large enough to accommodate all "special tools" furnished under this paragraph and as required by Sections 15165 DIESEL ENGINE PUMP DRIVES and 15170 RIGHT ANGLE GEAR REDUCERS. Mount cabinet on four rubber-tired casters. Provide drawers to accommodate tools. Fit front of cabinet with doors hinged to swing horizontally. Furnish doors with necessary stops, catches, and hasps for completely securing cabinet with a padlock. Furnish padlock complete with three keys. Pack "special tools" in wooden boxes if size and weight do not permit storage in tool cabinet. Provide slings if box and tools are heavier than 75 pounds. The padlock shall be a Master Lock conforming to the following:

Maximum Security lock

- a. High-Tech steel 3/8" (10mm) shackle

- b. Weather tuff layers brass body, extra corrosion resistant, dual locking layers
- c. Precision pin tumbler mechanism
- d. Rust proofing against the elements

Or an approved equal. The padlock shall be provided with two keys.  
The padlock may be purchased locally.

**PART 2 PRODUCTS**

**2.1 MATERIALS AND METALWORK FABRICATION**

Materials shall conform to requirements of paragraph REGULATORY REQUIREMENTS, subparagraph b., FAR 52.246-2, and to additional specified requirements. Classification and grade of material incorporated in work shall be in accordance with designated specifications. If Contractor desires to deviate from designated specifications, he shall, after award, submit to Contracting Officer for approval, complete specifications for proposed materials. Disapproval shall not be a basis for any contract price adjustment.

**2.1.1 Designated Materials**

Designated materials shall conform to the following specifications, grades, and classifications.

MATERIAL	GRADE	CLASS	SPECIFICATION
Aluminum-Bronze	Alloy No. C95500		ASTM B148
Cast Iron	Castings Class No. 30A, 30B and 30C		ASTM A 48
Cast Steel	Grade 65-35 annealed		ASTM A 27
Coal Tar Protective Coatings-Hot Applies			AWWA C203
Cold-Rolled Steel Bars	Min. Wt. Str. 65,000 psi		ASTM A 108
Copper Alloy Castings	Alloy No. C93700		ASTM B 584
Corrosion-Resistant Alloy Castings	Grade CA-15 CAGNM and CF-8M		ASTM A 297
Dimensions for Steel Water Pipe Fittings			AWWA C208
Hot-Rolled Stainless	Graded G10200 and G11410		ASTM A 576
Ring Flanges		Class B	AWWA C207
Rubber Products in Automotive Appl.			ASTM D 2000
Seamless and Welded Aust. Stainless Steel Pipe			ASTM A 312

Stainless Bars and Shapes	Grades	ASTM A 276
Shapes S41000	S30400	
Steel Forging	Class F	ASTM A 668
Steel Pipe 6 inches and Larger		AWWA C200
Steel Plates, Pressure Vessel	Grade 55	ASTM A 516
Steel Plates, Structural Quality	Grade B	ATSM A 285
Structural Steel		ASTM A 36
Surface Texture (Surface Roughness, Waviness, and Lay)		ASME B46.1

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## 2.1.2 Castings

### 2.1.2.1 Cast or Stamp Mark Number

Cast or stamp mark number on each casting. Cast or stamp heat number on each casting weighing more than 500 pounds. Warped, distorted, or oversize castings that will interfere with proper fit with other parts of machinery or structure will be rejected. Cracked castings of nonweldable materials (cast iron, etc.) will be rejected. Repairs to castings shall not be made prior to approval by Contracting Officer.

### 2.1.2.2 Visually Examine

Visually examine each casting for defects. Examine visually defective propeller and other castings using Magnetic Particle Tests. Magnetic particle tests and inspection shall conform to Appendix 6 of ASME-16 and ASTM E 709. Do not use castings with defects in steel disclosed by magnetic particle test which exceed the degree permitted by Appendix 7 of ASME-16.

### 2.1.2.3 Acceptance Criteria

Criteria for acceptance of castings and casting repairs, including the approved welding procedure for each material used, shall be developed by the Contractor. Standards that are not definitive or that delegate discretionary authority for acceptability of castings or casting repairs to manufacturer's representatives or other individuals are not acceptable. Castings not meeting approved criteria shall be either rejected or repaired as dictated by approved standards. Repairs shall be accomplished in accordance with approved procedure and repaired areas shall be reinspected to insure completed repairs are satisfactory.

## 2.1.3 Bolted Connections

### 2.1.3.1 Bolts, Nuts, and Washers

Bolts, nuts, and washers shall conform to requirements of paragraph MATERIALS AND METALWORK FABRICATION, subparagraph DESIGNATED MATERIALS, and paragraph VERTICAL PUMPS, subparagraph PUMP COLUMN AND DISCHARGE ELBOW, subparagraph NUTS AND BOLTS for types required. Use beveled washers where bearing faces have a slope of more than 1:20 with respect to a plane normal to bolt axis.

#### 2.1.3.2 Drill or Subdrill and Ream Holes

Drill or subdrill and ream holes for regular bolts in shop. Holes shall be accurately located, smooth, cylindrical and perpendicular to the member.

#### 2.1.3.3 Match-ream or Drill Holes

Match-ream or drill holes for fitted bolts in shop. Holes shall be smooth, cylindrical, and perpendicular to the member. Remove burrs resulting from reaming. Bolt threads shall be entirely outside of holes. Body diameter of bolt shall have tolerances as recommended by ASME B4.1 for class of fit specified. Selectively assemble fitted bolts in reamed holes to provide an LC-1 fit.

#### 2.1.3.4 Holes for High-strength Bolts

Holes for high-strength bolts shall be accurately spaced, cylindrical, and perpendicular to the member. Subdrill holes and ream to full size. If thickness of material is greater than diameter of bolt, holes may be drilled full size. Poor matching of holes will be cause for rejection. Drifting done during assembly shall not distort metal or enlarge holes.

#### 2.1.3.5 Materials Not Specifically Described

Materials not specifically described shall conform to latest ASTM specification or to other listed commercial specifications covering class or kinds of materials to be used.

### 2.1.4 Metalwork

#### 2.1.4.1 Flame Cutting of Material

Flame cutting of material other than steel shall be subject to approval of Contracting Officer. Shearing shall be accurately done, and all portions of work neatly finished. Steel may be cut by mechanically guided or hand-guided torches, provided an accurate profile with a smooth surface free from cracks and notches is secured. Surfaces and edges to be welded shall be prepared in accordance with Section 3 of AWS D1.1. Chipping and/or grinding will not be required except where specified and as necessary to remove slag and sharp edges of mechanically guided or hand-guided cuts not exposed to view. Visible or exposed hand-guided cuts shall be chipped, ground, or machined to metal free of voids, discontinuities, and foreign materials.

#### 2.1.4.2 Stress-Relieving Procedure

After all fabrication welding is completed, and prior to any machining, stress-relieve suction bell by heat treatment. Contractor shall submit proposed stress-relieving procedure for approval by Contracting Officer.

### 2.1.5 Machine Work

#### 2.1.5.1 Class of Fit Required

Tolerances, allowances, and gages for metal fits between plain, nonthreaded cylindrical parts shall conform to ASME B4.1, for class of fit required.

#### 2.1.5.2 Surface Finishes

Where surface finishes are indicated, or on Contractor's drawings, or are specified herein, symbols used or finishes specified shall be in accordance with ASME B46.1. Values of roughness height specified are the arithmetical average deviation expressed in microinches. Roughness specified is the maximum value and any lesser degree will be satisfactory unless otherwise called for on drawings. Compliance with specified surface shall be determined by sense of feel and by visual inspection of work compared to Roughness Comparison Specimens, in accordance with

provisions of ASME B46.1. Values of roughness width and waviness height are not specified, but shall be consistent with general type of finish specified by roughness height. Flaws such as scratches, ridges, holes, peaks, cracks, or checks, which will make part unsuitable for intended use, will be cause for rejection.

#### 2.1.5.3 Unfinished Surfaces

Lay out work to secure proper matching of adjoining unfinished surfaces. Where there is a large discrepancy between adjoining unfinished surfaces, chip and grind smooth, or machine surfaces, to secure proper alignment. Unfinished surfaces shall be true to lines and dimensions shown on contract or Contractor's drawings and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting strength or usefulness of parts shall be filled in a manner approved by Contracting Officer.

#### 2.1.5.4 Alignment of Wetted Surfaces

Exercise care to assure that correct alignment of wetted surfaces being joined by a flanged joint is being obtained. Where plates of the water passage change thickness, transition shall occur on the outer surface, leaving inner surface properly aligned. When welding has been completed and welds have been cleaned, but prior to stress relieving, joining of plates shall be carefully checked in the presence of Government inspector for misalignment of adjoining parts. Localized misalignment between inside or wetted surfaces of an adjoining flange-connected section of pump or formed suction intake shall not exceed amount shown in Column 4 of Table 1 for the respective radius or normal distance from the theoretical flow centerline. Misalignments greater than allowable amount shall be corrected by grinding away offending metal, providing the maximum depth to which metal is to be removed does not exceed amount shown in Column 5 of Table 1. No metal shall be removed until Contractor has assured himself and Contractor Officer that no excessive stresses will occur in remaining material and that excessive local vibration will not result from removal of the material. Where required correction is greater than the amount in Column 5 of Table 1, pipe shall be rejected for use. Proposed procedure for all corrective work, other than minor grinding, shall be approved by Contracting Officer prior to start of corrective work. Corrective work shall be finished by grinding corrected surface to a smooth taper. Length of the taper along each flow line element shall be 10 times the depth of the offset error at flow line. Wetted surface irregularities that might have existed in an approved model shall not be reason for accepting comparable surface irregularities in prototype pump.

TABLE 1

(1) Pipe Diameter Inches	(2) Pipe Radius or Distance Inches	(3) Pipe Thickness Inches	(4) Maximum Offset Inches	(5) Grind-Not More Than Inches
24	12		3/8	1/16
30	15		3/8	1/16
36	18		3/8	3/32
42	21		1/2	3/32
48	24		1/2	1/8
54	27		1/2	1/8
60	30		3/4	5/32
72	36		1	5/32
84	42		1-1/8	3/16

#### 2.1.5.5 Pinholes

Pinholes shall be bored true to gages, smooth and straight, and at right angles to axis of the member. Boring shall be done after member is securely fastened in position.

#### 2.1.5.6 Turn or Grind All Shafting

Unless otherwise specified or authorized, turn or grind all shafting. Provide fillets where changes in section occur.

#### 2.1.6 Welding

##### 2.1.6.1 Welding of Steel

Unless otherwise authorized or specified, welding of steel shall be by electric arc-welding process, using a method that excludes atmosphere from molten metal. Welding of steel, unless specified otherwise, shall conform to applicable provisions of AWS D1.1.

##### 2.1.6.2 Temporary Welds

Temporary welds required for fabrication and erection shall be made under controlled conditions prescribed herein for permanent work. Each temporary weld shall be removed after serving its purpose and ground flush with adjacent surfaces.

##### 2.1.6.3 Casting Repairs

Castings, except those of cast iron shall have all unsound material or defects removed by chipping, machining, air-arc gouging or grinding, and shall be repaired by welding. Welding repairs shall conform to welding procedures developed and approved for the type of material involved. Stress relief annealing shall be accomplished prior to final machining.

#### 2.1.7 Shop Assembly

Unless otherwise specified, each piece of machinery furnished, shall be assembled in the shop to determine correctness of fabrication and matching of component parts. Tolerances shall not exceed those specified or shown on Contractor's manufacturing drawings and each assembled unit shall be closely checked to ensure that all necessary clearances have been provided and that binding does not occur in any moving part. Assembly in shop shall be in the same position as final installation in the field unless otherwise specified. Perform assembly and disassembly work in the presence of a Government representative, unless waived in writing by Contracting Officer, and immediately remedy errors or defects disclosed without cost to Government. Before disassembly for shipment, matchmark each piece of a machine or structure to facilitate erection in the field. Indicate location of matchmarks by circling with a ring of white paint after the shop coat of paint has been applied, or as otherwise directed.

## 2.2 VERTICAL PUMPS

### 2.2.1 Speed

Rotative speed of pump shall be no greater than 425 rpm. Verify that rotative speed of pump at which the NPSH is produced is no less than required, as determined by cavitation tests specified in paragraph FACTORY TESTS.

### 2.2.2 Reverse Flow

Pump shall withstand, with no damage, the full force exerted on it, with impeller subjected to reverse flow and upper end locked in place by backstop. Calculate head to determine the force developed by this reverse flow from specified highest discharge side water elevation (336.2) and lowest pump intake side water elevation (307.0).

### 2.2.3 Efficiency

Efficiency at design condition specified in paragraph CAPACITIES shall not be less than 70 percent.

## 2.2.4 Suction Bell

Make suction bell of either cast iron, cast steel, or welded steel plate. Provide flanged connection for mating with impeller bowl with a rabbet fit or four equally spaced dowels installed in the vertical position for initial alignment purposes and to maintain concentric alignment of pump. Steel plate, if used, shall have a thickness of not less than ½ inch. Suction bell shall be made in one piece. Suction bell shall be supported entirely by pump casing. Supports from sump floor will not be acceptable.

## 2.2.5 Impeller Bowl

Make impeller bowl of either cast iron, cast steel, welded steel plate or a combination of cast steel and steel plate. Steel plate, if used, shall have thickness of not less than 5/8 inch after machining is completed. Welds shall be heat-treated stress-relieved before final machining. Provide flanges for mating with suction bell and diffuser bowl. Flanged connections shall be provided with a rabbet fit or four equally spaced dowels installed in the vertical position for initial alignment purposes and to maintain concentric alignment of pump. Machine finish impeller-swept area in impeller bowl to at least 125 rms and concentric with impeller axis. For mixed flow impellers, angle in impeller bowl shall equal the outside angle of impeller blade tips. Tolerance for concentricity of impeller with the impeller axis shall not be greater than 20 percent of the operating clearance between impeller and impeller bowl. The impeller and impeller bowl shall be designed with ample strength to support any bearing housings and to safely withstand the hydraulic pressure or other load caused by pump operation.

## 2.2.6 Diffuser Bowl

Make diffuser bowl of either cast iron, cast steel, welded steel plate, or a combination of cast steel and steel plate. Steel plate, if used, shall have thickness of not less than 5/8 inch after machining is completed. Diffuser shall contain support for upper impeller shaft bearing and have vanes to guide the pumped flow. Equip diffuser bowl with a bypass drain to outside of pump from the diffuser cavity located between the enclosing tube connection and impeller. Furnish throttle bushing located in the cavity immediately above impeller. Bypass drain and throttle bushing should be designed to reduce water pressure on lower seal. The impeller and diffuser bowl shall be designed with ample strength to support any bearing housings and to safely withstand the hydraulic pressure or other load caused by pump operation.

## 2.2.7 Pump Column and Discharge Elbow

### 2.2.7.1 Column and Discharge Elbow

Make column and discharge elbow of either cast iron, cast steel, or welded steel plate. Steel plate, if used, shall have thickness of not less than 5/8 inch after machining is completed. Elbow shall be of mitered type. Column and discharge elbow shall be designed to withstand internal pressures and external loading associated with various conditions of pump operation. Provide flanges for mating individual segments together and for mating pump column to diffuser bowl. Flanges shall have rabbeted fits or four equally spaced dowels installed in flanges for initial alignment purposes and to maintain concentric alignment. The elbow shall terminate in a plain-end circular section. Diameter tolerance of plain end shall be plus/minus 0.10 inch. Diameter of discharge end of elbow shall be as shown and shall allow standard diameter flexible couplings to be used. Adjustable thrust rods and thrust lugs shall be used to transfer the load by bridging the coupling.

### 2.2.7.2 Column and Discharge Elbow Support

Pump column and discharge elbow shall be designed for suspension from a baseplate assembly specified in paragraph 2.6 BASE PLATE AND SUPPORTS below and located at operating floor level. Design pumping unit for installation as shown. Baseplate for supporting gear reducer shall be at elevation of operating floor, EL. 324.17

### 2.2.7.3 Flanges

Machine flanges and drill bolt holes concentric with pump shaft vertical centerline, having tolerance of plus or minus one fourth of clearance between bolt and bolt hole. When fabricated from steel plate, flanges shall not be less

than 1-1/2 inches thick after machining. Flange thickness after machining shall not vary more than 10 percent of greatest flange thickness. Provide external stiffeners, if needed. Construct fabricated flanges, as a minimum, to the dimensions of AWWA C207, Class B. Flanges on major components of pump casing, suction bell, impeller bowl, diffuser bowl, and column and elbow piping shall be designed such that blindholes necessitating use of cap screws or stud bolts will not be used. Design flanges for connection to column pipe by at least two continuous fillet welds. One weld shall connect inside diameter of flange to pump column and the other shall connect outside diameter of pump column to flange. Final design of welds rests with manufacturer, and specified welds are the minimum requirement. They shall be parallel machined, when provided on each end of the same component, and mounted parallel to a plane that is normal to pump shaft centerline. Flanges on each end of the same component shall have parallel tolerance of 0.002 inch. Finish machine mating surface on flange to 125-microinch finish or better. Provide flanges with minimum of three jacking bolts to aid in disassembly of pump.

#### 2.2.7.4 Flanged Joints

Design flanged joints to be air-and water-tight, without the use of preformed gaskets, against positive and negative operating pressures that will be experienced, except that "PERMATEX" or equal gasketing compound will be permitted. Provide mating flanges, unless of the male-female rabbet type, with not less than four tapered dowels equally spaced around flange. If rabbeted fit is not used, then Contractor shall provide the method used to determine concentricity of connected pieces.

#### 2.2.7.5 Nuts and Bolts

Bolts used in assembling pump and its supporting members, including anchor bolts and dowels, shall be of 300 series stainless steel. Use only bronze nuts and hexagonal bolts and nuts. Washers shall be 300 series of stainless steel.

#### 2.2.7.6 Harnesses Coupling

Provide flexible mechanical coupling connecting pump discharge elbow to wall thimble equal to Dresser style 38 coupling or approved equal. Furnish middle ring without pipe stop to facilitate installation and removal of coupling.

#### 2.2.8 Impeller

Make impeller hub and blades of cast 316 stainless steel. Brinnell hardness shall be a minimum of 200 and tensile strength shall be 30,000 psi minimum. They may be cast separately or together as a single unit. If cast separately, attach blades to hub in a manner that ensures them against loosening in service but that does not necessitate any damage during disassembly. Welding of blades to hub is acceptable. If this method of attachment is used, Contractor shall submit welding procedure to be used.

##### 2.2.8.1 Casting Inspections

After removal from mold, and prior to finishing of surface imperfections, castings shall be inspected by Contracting Officer. Minor surface imperfections shall be filled or ground down as necessary to preserve correct contour and outline of impeller and to restore surface imperfections to the same degree of finish as surrounding surfaces. Correct surface pits, depressions, projections, or overlaps showing greater than 1/16 inch variation from the general contour for that section. Castings that exhibit surface imperfections (as defined above) covering an area of more than 10 percent of blade surface will be rejected.

##### 2.2.8.2 Statically Balance

Statically balance finished impeller to within 12 oz-in of unbalance. Then dynamically balance impeller by the two-plane balancing technique. Impeller shall be balanced at rated operating speed. Check balance at 110 percent of balance speed, and make needed corrections. Amount of allowable unbalance shall be in accordance with ASA S2.19. Weights needed to obtain required level of balance shall be securely fastened to inside cavity of impeller hub. In no case will portions of the impeller be removed or weights be added to outside of hub, vanes, or water passages. Submit balancing procedure to Contracting Officer for approval at least four weeks prior to date of

balancing. Each finished impeller shall be weighted and weight stamped on the bottom of hub. Weight shall be accurate to 0.5 percent of the total weight of impeller. Weighing and balancing shall be witnessed by Contracting Officer.

## 2.2.9 Shafts

### 2.2.9.1 Impeller Shaft

Impeller shaft shall be stainless steel and intermediate shafts shall be cold-rolled carbon steel. Design shafting so that any necessary vertical adjustment of impeller can be made from operating room floor without interfering with shaft alignment. Also provide for removal of impeller from below without disassembly of pump above impeller bowl. Design shafts based on criteria set forth in ASME B106.1M for two different design cases. The first uses a factor of safety of 5 based on ultimate tensile strength of shaft material and rated horsepower of engine. The second uses 75 percent of the yield strength of shaft material and maximum horsepower of engine.

### 2.2.9.2 Pump and Gear Reducer Shafts

Pump and gear reducer shafts shall be coupled together using rigid flanged coupling capable of transmitting the forces and torques involved. Coupling halves shall be bolted together and shall be maintained concentric with each other, by means of a rabbet fit, to within 0.002 inch. Shaft coupling nut, if used, shall be retained by fitted bolts, and all tolerances specified for the coupling shall apply. Finish machine the flange and bore in one setup to insure that flange of coupling shall be true to the bore. Flange shall be perpendicular to the bore, and parallel to the opposite end and mating flanges to within 0.002 inch. Flange shall be concentric to centerline of shaft to within 0.002 inch. The finished shaft assembly shall be concentric about shaft centerline to within 0.004 inch. Shop assemble couplings and pump shaft and inspect for compliance with contract requirements. After inspection, matchmark parts, including fitted bolts, to their mating pieces.

### 2.2.9.3 Pump Shaft Sections

Pump shaft sections shall be joined together with sleeve-type couplings capable of taking rotation in either direction. Threads, except on fasteners, shall not be employed in construction of sleeve-type couplings. Couplings, including keys and fasteners, shall be constructed of stainless steel materials.

### 2.2.9.4 Removable and Renewable One-piece Journals

Provide stainless steel removable and renewable one-piece journals at each bearing and the packing gland. Securely fasten journals to shaft to prevent shifting. Keys and fasteners, if used, shall be made from corrosion resisting steel. Fastening of journal sleeves to shaft by welding or by adhesives will not be permitted. Shaft finishes/construction at lower seal locations shall be as specified in paragraph VERTICAL PUMPS, subparagraph GUIDE BEARINGS, subparagraph GREASE LUBRICATION SHAFT SEALS.

## 2.2.10 Shaft Enclosure

Provide shaft enclosure to cover intermediate shaft and coupling. It shall be placed in tension or shall be rigid enough to be self-supporting. External supports or bracing located in pump water passage shall not be used for support of the enclosing tube unless necessary to support intermediate bearings or indicated to be necessary or advantageous by dynamic analysis required in paragraph 2.5.1 DYNAMIC ANALYSIS. Consider effect of external supports, including rubber inserts, in the dynamic analysis required in paragraph 2.5 TEST, INSPECTIONS, AND VERIFICATIONS, subparagraph 2.5.1 DYNAMIC ANALYSIS, below. Design enclosure to be watertight and for easy assembly and disassembly in the field. Enclosing tubes constructed with screw type joints and using tension in tube to hold alignment, shall be constructed to prohibit tension tube from unscrewing when packing gland adjustments are made. Provide shaft enclosure for grease-lubricated pumps with a drain having a shut-off valve located outside of the pump to permit draining enclosure between operation periods. Locate drain at bottom of shaft enclosure.

### 2.2.11 Lifting Lugs

Furnish major pump components with lifting lugs or eyebolts to facilitate handling. Design and arrange lugs or bolts to allow safe handling of pump components singly or collectively as required during shipping, installation, and maintenance.

### 2.2.12 Guide Bearings

#### 2.2.12.1 General

Provide pump with sleeve-type bearings designed for grease lubrication. Bearing shall have a bronze lining in contact with shaft journal and shall be removable and renewable type. Arrange bearing liner for maximum distribution of grease for lubrication of journal surface. Bearings shall have a surface finish of 32 rms or better. Since pumped water may contain some fine sand and silt in suspension, give special attention to the design and selection of bearing parts, especially seal rings, to preclude entrance of foreign material between bearing and journal or journal sleeve and shaft due to differential water pressure.

#### 2.2.12.2 Grease Lubrication Shaft Seals

Pumps designed for grease lubrication shall have a shaft seal consisting of lip seals. Seal system shall consist of a lip-type seal located on each end of bearing. Each seal shall contain a lip element having a stainless steel garter spring back up and be constructed of TFE (Teflon). Lip element shall face bearing. Lowest bearing shall have an additional grease seat with lip facing away from bearing. Grind shaft to finish of 16 rms at seal location. Shaft surface under seal area shall have a hardness as recommended by seal manufacturer or shall be fitted with a replaceable stainless steel sleeve of manufacturer's recommended hardness. Use bullet-shaped assembly tool or other special tools over the end of shaft and shaft grooves to preclude damage to lip element during assembly. Assembly tool used is considered a special tool and shall be furnished to Government as part of special tools specified in paragraph MAINTENANCE, subparagraph SPECIAL TOOLS.

### 2.2.13 Bearing Heat Sensors

Fit each bearing with temperature-sensing elements, inserted in bearings to within 1/8 inch of shaft. These temperature-sensing elements shall be provided with temperature readouts at a central location as shown. Provide visual and audible alarm system to warn of bearing overheating. Support leads and protect from water and mechanical damage. Terminate leads outside of pump casing in a waterproof connection head Minco CH 339, or equal and cap until final connections are made in the field. The connection head shall be rated watertight to 25 psi. Lead protection shall consist of pipes fastened to pump with brackets using bolts and nuts to permit their removal, and shall be constructed with enough unions to be completely disassembled. Leads passing through pump water passage in pump shall either be contained in a guide vane or be protected by Schedule-80 pipe. Protection pipe shall be removable if connected to shaft-enclosing tube. Install bearing heat sensors as shown in Figure 2 at end of the section. Run leads and wiring to a junction box located on baseplate. Provide terminal strip in junction box for connection of wiring to temperature readouts.

### 2.2.14 Thrust Bearing

Provide thrust bearing to carry total thrust load in right angle gear reducer as specified in Section 15170 RIGHT ANGLE GEAR REDUCERS.

### 2.2.15 Packing Gland

Provide grease-lubricated packing gland split longitudinally to facilitate removal or renewal. Arrange it to permit inspection, repair, removal, or replacement of packing without entering pump from below operating room floor. Provide eyebolts and tapped holes in each half of the split gland if halves weigh over 30 pounds each.

## 2.3 LUBRICATION SYSTEM

Support grease lines to each bearing and protect from water and mechanical damage. Grease line protection shall consist of channels fastened to pump with brackets, using bolts and nuts to permit removal. Grease lines passing through pump water passage shall either be contained in a guide vane or be protected by Schedule-80 pipe. This protection pipe shall be removable if connected to shaft-enclosing tube. Prefill grease lines before connection to bearings. Terminate grease lines above baseplate for connection to lubricating grease pump.

### 2.3.1 Centralized Pressure Lubrication System

#### 2.3.1.1 General

Provide each pump with its own individual electric motor- driven centralized pressure lubrication system, designed to deliver the proper predetermined or metered quantity of lubricant to each individual bearing and stuffing box. It shall positively indicate proper or improper functioning of any individual metering device. Mount pressure pump, individual metering devices, and any required auxiliary operating accessories suitably on baseplate. System shall be furnished complete and ready for operation, including sufficient lubricant to fill each pressure pump lubricant reservoir. Submit complete centralized pressure lubrication system to Contracting Officer for review and approval. Furnish lubricant recommended by pump manufacturer.

#### 2.3.1.2 Pumping Unit

Provide Electric motor-driven central pumping unit as a complete assembly, consisting of positive displacement type pump, flow-directing valve (if required), lubricant reservoir, suitable pressure gage to indicate pump discharge pressure, operation counter, pressure protective device, and other auxiliary accessories as required to give a complete and workable unit conforming to requirements specified. Pump shall be of multiple individual piston, positive displacement type utilizing hardened steel pistons closely fitted to cylinder bores to eliminate the need for packing, and spring-actuated check valves shall not be required for its operation. Pump shall deliver not less than 6 cubic inches of lubricant per minute against a pressure of not less than 2,000 pounds per square inch measured at the most remote bearing connection. Lubricant reservoir shall be of suitable metallic construction, shall have a capacity of not less than 24 pounds of lubricant, shall be provided with suitable means that will ensure positive priming of pump at all times (such as an atmospheric or spring-loaded follower plate), an indicator to show quantity of lubricant in reservoir, and a screened fill connection to permit filling reservoir by transfer pump without exposing lubricant to atmosphere. Provide pump unit with a fully automatic control system, capable of suitable or proper scheduling by an adjustable synchronous motor-driven timing device, and other required auxiliaries necessary to give a complete and workable system. Provide controller with a "Hand Off-Automatic" selector master switch to permit selection between push button manual and automatic time clock operation, and to deenergize the system. Electric power will be supplied at 115 volts single phase, 60 cycles. Use time clock setting recommended by main pump manufacturer.

#### 2.3.1.3 Metering Valves

Provide metering or measuring valve for each bearing and stuffing box. It shall be fully hydraulic in its operation, requiring no internal springs or check valves. Valve for any given lubricated device shall have sufficient capacity to deliver a maximum quantity of lubricant equal to approximately one third of nominal clearance volume of bearing or gland served each time measuring valve is discharged or system is cycled.

#### 2.3.1.4 Piping

System piping shall be stainless steel tubing AISI, (Type 410 or equal) using flared or compression-type connectors. Adequately protect and rigidly support piping located below operating room floor in a manner approved by Contracting Officer. Provide each individual grease line with a "Tee" fitting, located immediately below the respective metering valve and accessible from operating room. Also provide with a standard 1/4-inch grease fitting so that each individual line may be fully charged without using pump of lubricating system. Size and strength of pipe and type and strength of fittings shall be as recommended and guaranteed by lubrication system manufacturer, but in no case shall bursting pressure of pipe or tubing used be less than three times the maximum working pressure. Provide check valve located between discharge outlet of the measuring valve and "Tee" fitting specified above in

each lubricating line of bearings that is exposed to water pressure to prevent entrance of water into the respective measuring valves.

### 2.3.2 Lubrication System Accessories

#### 2.3.2.1 Grease Gun

A hand operated, heavy duty lever grease gun for charging lubrication lines and for emergency lubrication shall be provided. Provide grease as recommended by the vertical pump manufacturer.

#### 2.3.2.2 Service Facilities

A service facility consisting of a portable hand operated transfer pump, a hand-towed dolly, and a 120 pound drum of lubricant, all assembled and ready for operation shall be provided. The pump shall be self-contained and designed for mounting on the grease drum to protect the contents from the entrance of foreign matter. The pump shall deliver not less than one pound in not more than eight strokes of the pump handle under normal temperature conditions. Furnish necessary hose and quick disconnect coupling for a complete system. The hand-towed dolly shall have a rigid platform with four anti-friction bearing mounted wheels, a towing handle and a provision for securing the lubricant barrel. The type of lubricant shall be as recommended by the vertical pump manufacturer.

## 2.4 FACTORY FINISHING

### 2.4.1 Painting

Pump shall be factory painted in accordance with Section 09900 - PAINTING, GENERAL.

## 2.5 TESTS, INSPECTIONS, AND VERIFICATIONS

### 2.5.1 Dynamic Analysis

Assembled pumping unit, consisting of engine, speed reducer and pump shall be free from critical speeds of harmful torsional vibrations at all speeds encountered within the operating range.

#### 2.5.1.1 Torsional Analysis

Before pump, gear drive, and engine are released for manufacture, engine supplier shall analyze the system for harmful torsional natural frequencies using mass elastic information provided by pump and gear drive manufacturers. A natural frequency that occurs within 25 percent above or below normal operating speed is considered to be unacceptable.

#### 2.5.1.2 Lateral Frequency Analysis

Before pump, gear drive, and engine are released for manufacture, pump/gear drive structure shall be analyzed by pump manufacturer for harmful natural frequencies in the lateral directions. A natural frequency that occurs within 25 percent above or below normal operating speed is considered to be harmful. The dynamic analysis model shall be constructed using a commercially available program such as Ansys, Cosmos/M, or equivalent, that utilize finite element methods. The model shall incorporate effects of column pipes, cover pipes, shafts, bearings, mass concentrations, and other such features as necessary to accurately model pump structure. Analyze structure in the run (wet) condition and consider the effect of water mass in the column and damping effect of water in the sump at highest and lowest sump water levels. Incorporate Reed critical frequency and mass elastic diagram information provided by gear reducer manufacturer. If gear reducer manufacturer cannot demonstrate to the satisfaction of Contracting Officer (based on impact tests of similar units) that the Reed critical frequency value is accurate, a dynamic analysis using finite element methods as described herein shall be conducted by gear reducer manufacturer

to determine gear drive Reed critical frequency for use by pump manufacturer. Submit complete dynamic analysis report including the following information:

- a. Computer program used.
- b. Schematic diagram of the model depicting nodes and elements.
- c. Input data consisting of node coordinates, element types, material properties, element characteristics, element connectivities, and specified displacements.
- d. Gear mass elastic and Reed critical information (or dynamic analysis, if required).
- e. Analysis results, including significant natural frequencies.
- f. Interpretation of results.

Impact-test gear drive before shipment to determine actual Reed critical frequency of the drive. Submit results of impact tests. Pump manufacturer shall address any discrepancy between calculated and actual gear drive Reed critical frequency values as to whether or not design changes are required to prevent harmful natural frequencies in the pump/gear drive structure. If any design changes are required, these shall be incorporated at no cost to Government.

#### 2.5.2 Lubricating System Tests

Test complete lubricating system for each pumping unit, as deemed necessary by Contracting Officer, to determine that system meets operational requirements specified. At least one valve of each size furnished shall be tested with the lubrication line removed from its bearing and fitted with a pressure relief valve and pressure gage. The pressure relief valve shall be adjusted to discharge it at the operating pressure specified and the system shall be operated through one or more cycles as required to obtain an accurate measurement of the quantity of lubricant delivered, which shall be within plus or minus 20 percent of the theoretical delivery of the respective valve. Any component parts that are damaged as the result of these tests or that fail to meet the requirements of the specification shall be replaced, reinstalled, and retested at the Contractor's expense.

#### 2.5.3 Factory Test

##### 2.5.3.1 General

The performances and cavitation limits of the prototype pump shall be determined by a series of tests made on a scale model of the pump. The model test shall be completed within 180 days after date of notice to proceed.

##### 2.5.3.2 Test Setup

Model Pump - Model pump shall be homologous to the proposed prototype pump, shall be installed with shaft in vertical position, and shall have an impeller inlet diameter of not less than 11 inches. The sump where the pump suction occurs shall be equipped with windows strategically located for viewing those areas where separation is likely to occur.

##### 2.5.3.3 Instrumentation and Procedures

Each instrument shall be described in detail, giving all data applicable, such as manufacturer's name, type, model number, certified accuracy, coefficient, ratios, specific gravity of manometer fluid to be used, and smallest scale division. When necessary for clarity, sketch of instrument or instrument arrangement shall be included. Include fully detailed narrative description of each proposed method of instrumentation, procedures to be used, and a sample

set of computations. State the lowest equivalent static head that is obtainable with the testing when operating along the head-capacity curve of proposed pump.

- a. Head Measurements - Head measurements shall be made using either a direct-reading water column, a mercury-air or mercury-water manometer, or a pressure transducer. Vacuums shall be measured with either a mercury-air or mercury-water manometer or a pressure transducer. Fluctuations shall be dampened sufficiently to permit the column gages and transducers to be read to either the closest one-hundredth (.01) of 1 foot of water or one-tenth (.1) of 1 inch of mercury. When pressure transducers are used, their accuracy shall be checked with a manometer.
- b. Capacity - Determine capacity by calibrated venturi flowmeter or long-radius ASME flow nozzle. Do not use orifice plates. Connect venturi or nozzle taps to column gages equipped with dampening devices that will permit differential head to be determined to either the closest one-hundredth (.01) of 1 foot of water or one-tenth (.1) of 1 inch of mercury. Magnetic flowmeters and flowmeters utilizing ultrasonic flow measurements will be acceptable if calibration of flowmeter has been completed within the last 6 months.
- c. Rotational Speed of Pump – The rotational speed of pump shall be measured in accordance with "Measurement of Speed" in HI-01, except that revolution counters shall not be used. Non-contacting hand-held electronic tachometers are acceptable. Device used shall permit speed to be determined to 1 rpm.
- d. Power Input - Measure power input to pump in accordance with "Power Measurements" in HI-01. Use a method to permit pump brake horsepower to be determined to the closest 0.5 horsepower.
- e. Cavitation Tests - The instruments to be used for these tests shall be selected by the Contractor and shall be of the type suited for cavitation testing. However, in no case shall the instruments used yield results less accurate than those obtained with the performance test.

#### 2.5.3.4 Pump Test

The model shall be sufficiently extensive and complete to demonstrate that the proposed pump complies with the specified performance. Compliance with the requirements of the specifications will be determined from the curves submitted. Test procedures, except as herein specified, shall be in accordance with applicable provisions of HI-01.

- a. Performance of The Prototype Pump - The performance of the prototype pump shall be determined by a series of test points sufficient in number to develop a constant- speed curve over the range of total heads corresponding to the static heads in paragraph CAPACITIES. The performance/test range shall include additional testing at total heads 2 feet higher than the total head determined in paragraph CAPACITIES. The lowest total head for testing shall be, as a minimum, the total head determined from paragraph "CAPACITIES". If the test setup permits testing at lower total heads, the range of total heads shall be extended 2 feet lower. Testing shall be inclusive for rated speed of the pump with the sump at elevation 319.0. Tests shall be made using prototype total heads. Head differentials between adjacent test points shall not exceed 3 feet. If the plot of the data indicates a possibility of instability or dip in the head-versus-capacity curve, a sufficient number of additional points on either side of instability shall be made to clearly define the head-capacity characteristics. For compliance with the guarantees, the efficiency of the prototype pump shall be considered to be the efficiency of the model. No other computation or adjustment of model efficiency to prototype conditions will be permitted unless expressly permitted elsewhere in these specifications.
- b. Sump Elevations – Preliminary tests shall be conducted at two different sump elevations (approximately a 5-foot differential) to determine the effect of test sump geometry on the performance of the model pump. Should the test results indicate that the performance is not the same in all respects for both sump conditions, the Contractor shall take whatever corrective action is necessary to produce congruent results.

- c. Tests Results - Plot results of tests to show total head, brake horsepower and efficiency as ordinates; all plotted against pump discharge in gallons per minute as the abscissa. Plot curves showing prototype performance to a scale that will permit reading head directly to .5 foot, capacity to 100 gallons per minute, efficiency to 1 percent, and power input to 10 horsepower.

#### 2.5.3.5 Cavitation Tests

- a. Model Test - NPSHR shall, as a minimum, be determined for five or more capacities corresponding to prototype capacities over the total range of specified operating conditions. If the pump has a capacity greater than that specified for the lowest and/or highest operating condition, then these over-capacity conditions shall be used. The other test capacity points shall be equally spaced between the highest and lowest capacities.
- b. NPSHR - NPSHR shall be determined on a constant- capacity, constant-speed basis, using an arrangement similar to that described under paragraph "Cavitation Tests" for vertical pumps in the test code section of "Centrifugal Pumps" in HI-01. Suction conditions shall be varied to produce cavitation. NPSHR shall be the maximum value at which any one or all of the plotted curves, head, horsepower, and efficiency depart from the constant values (point of tangency). A sufficient number of points to accurately locate the departure point shall be obtained.
- c. Value of NPSHR - The value of NPSHR shall be 1 foot less than the corresponding available net positive suction head (NPSHA). NPSHA shall be determined using the temperature of the water in the model at the time the tests are run and the datum shown on Figure 3 at the end of this section. The water elevations specified in paragraph CAPACITIES shall be used to determine the NPSHA for the pumps.
- d. Plotting Test Results - The test results shall be plotted to the scales determined by the Contracting Officer at the time of the test. Curves showing total head, brake horsepower, and efficiency as ordinates and NPSH as the abscissa shall be drawn. In addition, curves showing NPSHR versus capacity shall be drawn with NPSH as the ordinate and capacity as the abscissa. NPSHA points shall be shown on the curves.
- e. Curves - Should it be considered necessary by the Contractor to take into account measurement inaccuracies when drawing the curve needed to determine NPSHR in accordance with paragraph NPSHR, the following method shall be used. No other method will be acceptable. The inaccuracy shall be determined by the Contractor for each parameter, and the calculations shall be furnished to the Contracting Officer for approval. Using the calculated inaccuracy as the radius and the test point as the center, a circle shall be drawn for each test point. Two curves, one a maximum and the other a minimum, shall be drawn and shall pass through or touch each circle. The maximum curve shall touch the top and the minimum curve shall touch the bottom of as many circles as is practicable while maintaining smooth curves. Should the plot indicate that a test point is obviously erroneous, it may be ignored by mutual consent or the test may be rerun. Halfway between the maximum and minimum curves, another curve (the mean) shall be drawn. The point at which the mean curve departs from the constant values (point of tangency) shall be considered to be the NPSHR of the pump for the capacity at which the test was run.

#### 2.5.3.6 Blade Templates Demonstration

The Contractor shall demonstrate to the Government witness that the blade templates fit the tested pump. The demonstration shall be done immediately after the performance/cavitation testing is completed. The Contractor shall retain all templates for the accepted pump model and for the prototype, and shall furnish them to the Government upon request of the Contracting Officer, to permit the Government to verify that the prototype pump is in complete geometric similarity with the model. In lieu of providing templates, the Contractor shall furnish dimensioned drawings of the impeller that contain all dimensions needed to manufacture the impeller. The Contractor shall retain the model pump impeller used for the test until final acceptance of the prototype pump. The model impeller shall be stamped with identification marks. The Contractor shall retain all templates for the components of the tested model

or prototype pump, or both, and shall furnish them to the Government upon request of the Contracting Officer along with the necessary facilities and instruments needed to permit the Government to verify that the prototype pump is in complete geometric similarity with the model pump or the tested pump.

#### 2.5.3.7 Witness Test

When Contractor is satisfied that model performs in accordance with specification (and guaranteed values), he shall notify Contracting Officer that witness tests are ready to be run and furnish him two copies of curves required by paragraphs SUMP ELEVATIONS and TEST RESULTS, along with a set of sample calculations including all constants and conversion factors. Two weeks will be required to review these data before Contracting Officer will be available to visit Contractor's laboratory for witnessing test. Should the witness test reveal that the model does not perform in accordance with specification, Contractor shall make such changes as are required to make the model acceptable before again notifying Contracting Officer that witness tests are ready to be run. Immediately upon completion of each witness test, copies of all data taken, computations of test results, and plotted curves shall be furnished to the witness.

#### 2.5.3.8 Test Report

The Contractor shall submit, within 30 days of receipt of approval of the witness test, to the Government, four (4) bound copies of a report covering the model performance and cavitation tests. Each test report shall include, as a minimum, the following:

- a. Statement of the purpose of test, name of project, contract number, and specified pumping conditions.
- b. A resume of preliminary studies, if such studies were made.
- c. Description of the model pump and motor, including serial numbers, if available. Information required under "b" may be included here.
- d. Copies of calibration of instruments used.
- e. Description of test procedure used, including dates, test personnel, any retest events, and witness test data.
- f. Sample computations (complete).
- g. A discussion of test results.
- h. Conclusions.
- i. Photographic evidence in the form of either 24 color photographs of test equipment, test setup and representative test segments, or a VHS videotape, at least 30 minutes in length, covering the same information as photographs. All photographic evidence should be labeled with Contract number, location, date/time, and test activity. Videotape shall be voice annotated with the same information.
- j. Copies of instrument calibration.
- k. Copies of all recorded test data.
- l. Curves required by paragraph TESTS RESULTS.
- m. Curves showing the performance of the prototype pump.

## 2.6 BASEPLATE AND SUPPORTS

The baseplate shall be proportioned to support the entire pump assembly, the reduction gear and the loads (including the results of the dynamic analysis) to which it may be subjected during operation. It shall be supported and anchored as shown on the drawings. Lifting lugs or eyebolts, special slings, strongbacks, or other devices necessary to handle the pump during loading, unloading, erection, installation, and subsequent disassembly and assembly shall be furnished. A sole plate as shown on the drawings shall be provided under the baseplate. Jacking bolts shall be provided for leveling the baseplate assembly. An anchor bolt layout shall be provided to aid in placement of anchor bolts. All leveling jacking bolts shall be backed off after grouting so that they do not support any of the load. The pedestal supporting the engine right-angle reduction gear shall contain a 1-inch lip to contain water leakage from the shaft packing. A threaded drain to the sump shall be provided.

## 2.7 FREEZE PROTECTION

All parts of the pump shall have drain holes to eliminate trapped water that could freeze. These drain provisions shall be self-draining without any requirement to enter the sump.

## 2.8 FACTORY ASSEMBLY

The pump shall be assembled at the manufacturer's plant to assure proper fitting and alignment of all parts. The suction bell, impeller housing, diffuser, and the discharge elbow shall be properly match marked and have their centerlines clearly marked on the outside of all flanges to facilitate erection and alignment in the field. The Contractor shall notify the Contracting Officer sufficiently in advance to permit a representative of the Contracting Officer to inspect and witness the pump assembly. All parts disassembled for shipment shall be matchmarked.

## 2.9 NAMEPLATE

The pump shall be identified by means of a separate nameplate permanently affixed in a conspicuous location. The plate shall bear the manufacturer's name, model designation, serial number if applicable, and other pertinent information such as horsepower, speed, capacity, type, direction of rotation, etc. The plate shall be made of corrosion-resisting metal with raised or depressed lettering and contrasting background.

## 2.10 INSTRUCTION PLATES

The pump shall be equipped with suitably located instruction plates, including any warnings and cautions, describing any special and important procedures to be followed in starting, operating, and servicing the equipment. Plates shall be made of corrosion-resisting metal with raised or depressed lettering and contrasting background.

## 2.11 GUARDS AND COVERS

Safety guards and/or covers shall be provided wherever necessary to protect the operators from accidental contact with moving parts. Guards and covers shall be of sheet steel, expanded metal, or another acceptable material and removable for disassembly of the pump.

## 2.12 SPARE PARTS

The Contractor shall furnish the following spare parts:

- a. One complete replacement set of wearing parts for the packing gland for one pump, and sufficient packing for all main pumps.

## PART 3 EXECUTION

### 3.1 INSTALLATION

The installation of the equipment furnished under this section and related drive machinery furnished under other sections of this specification shall be in accordance with the approved Installation and Erection Instructions Manual required by paragraph SUBMITTALS. The erection engineer(s), familiar with the equipment to be installed, shall supervise the handling, installation, start-up and testing of the equipment as required by paragraph ERECTION ENGINEER (S).

### 3.2 FIELD TESTS

#### 3.2.1 Dry Tests

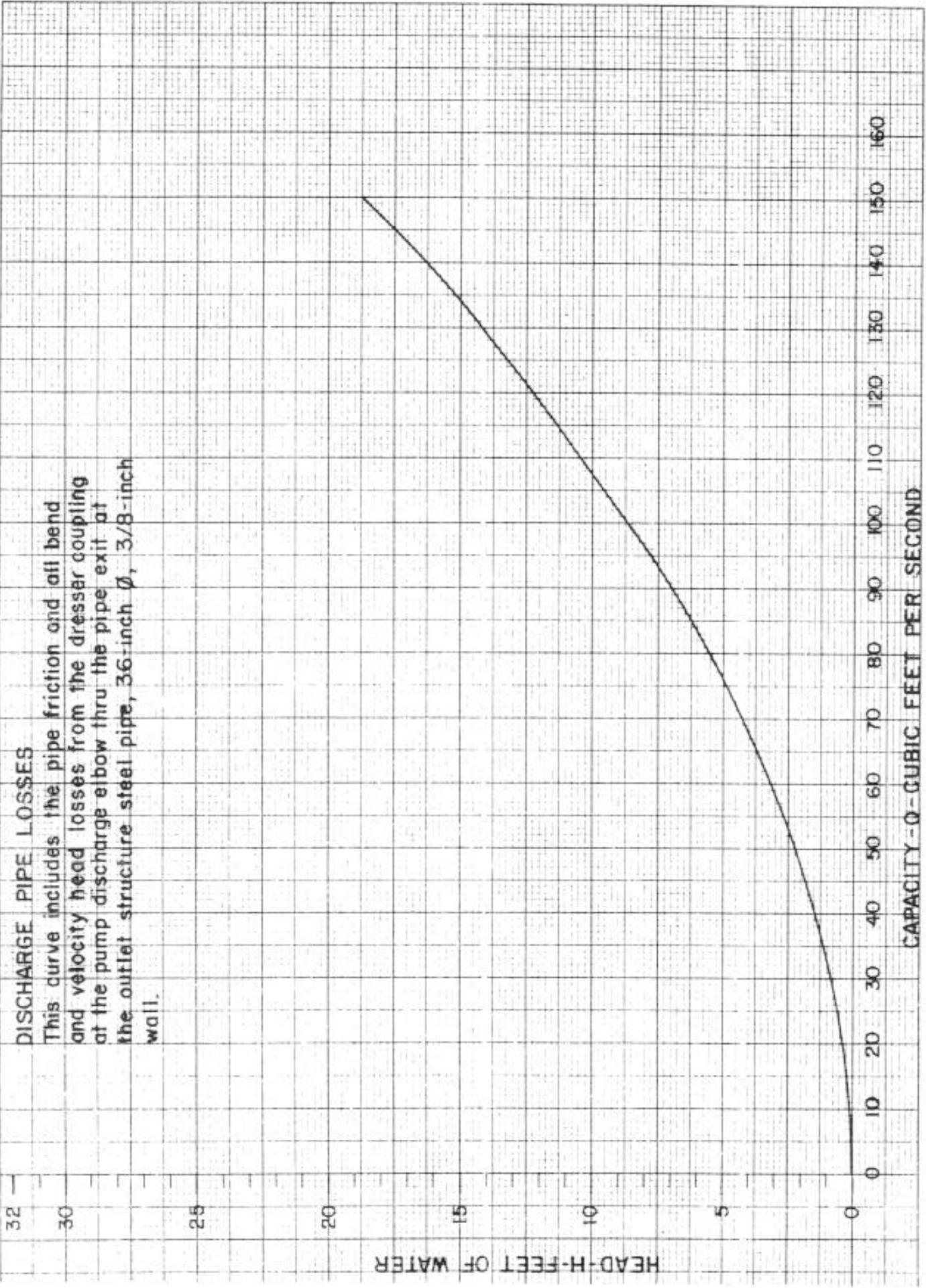
Pumping unit, consisting of pump, right-angle gear reducer, and diesel engine shall be tested in the dry to determine whether it has been properly erected and connected. Such test shall be made when, and as, directed by Contracting Officer. After pumping unit has been completely assembled, including all rotating elements and lubrication system, operate at full rated speed for three 15-minute periods, to assure proper alignment and satisfactory operation. Vibration measurements, in both axial and radial directions, will be made by Government. Measurements will be made on pump casing flanges, pump base plate, and, if possible, on bearing housings. Vibration measurements will be analyzed by Government personnel to determine acceptability of pumping installation. Vibration amplitude levels shall conform to those described in paragraph SYSTEM DESCRIPTION, subparagraph PERFORMANCE REQUIREMENTS. Results will be made available to Contractor upon request. Contractor may elect, at his own expense, to check data obtained by Government. Erecting engineers, as specified in Section 6, shall assist Contracting Officer in this test. Pumping unit shall be operated at full-rated speed until the temperature rate of rise has stabilized for all bearings. Bearings' temperature shall be considered stabilized when the rate of rise does not exceed 1 degree Fahrenheit in five minutes. Dry test run shall be repeated if it is necessary to interrupt the test before all bearing temperatures have become stable. Should tests reveal that there is a design deficiency or a manufacturing error in pumping unit components, the problem shall be promptly corrected by and at the expense of Contractor.

#### 3.2.2 Wet Tests

Pumping units shall be run under operating conditions to ensure that there are no leaks at any of the made-up joints. Government personnel will measure vibration levels during wet testing. Each pump shall be operated for a period of 2 hours. If deficiencies require correction, pumping unit shall be retested after deficiency has been corrected. Should there be insufficient water to perform test, Contracting Officer may, at his option, waive the test.

-- End of Section --



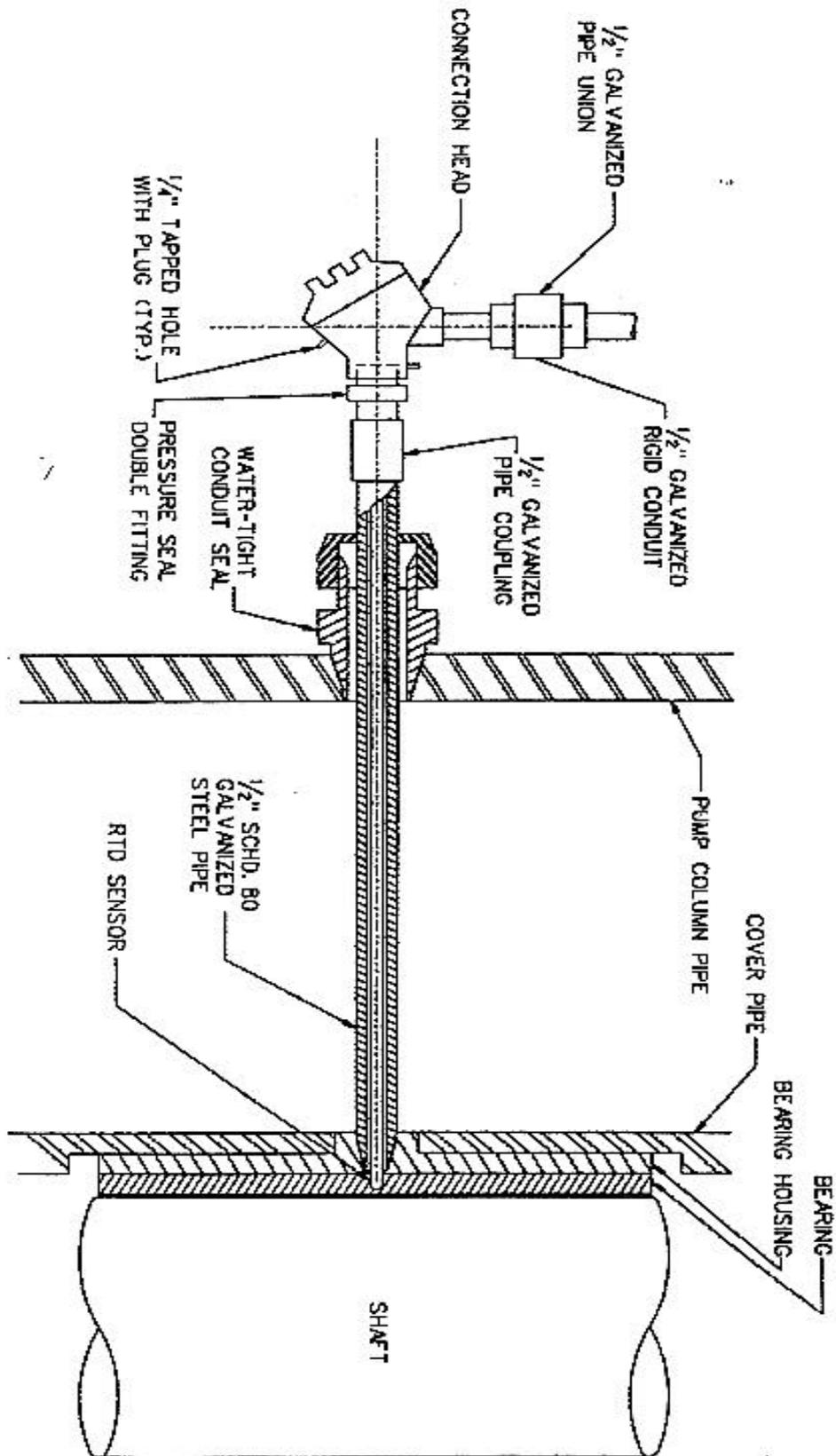


**DISCHARGE PIPE LOSSES**

This curve includes the pipe friction and all bend and velocity head losses from the dresser coupling at the pump discharge elbow thru the pipe exit at the outlet structure steel pipe, 36-inch  $\varnothing$ , 3/8-inch wall.

HEAD-H-FEET OF WATER

CAPACITY-Q-CUBIC FEET PER SECOND



RTD INSTALLATION FOR VERTICAL WET PIT PUMPS

FIGURE NO. 2

DIVISION 15 - MECHANICAL

SECTION 15165

DIESEL ENGINE PUMP DRIVES

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DIVISION 15 – MECHANICAL

SECTION 15165

DIESEL ENGINE PUMP DRIVES

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all plant, labor, equipment and material and performing all operation required to design, manufacture, assemble, factory test as specified or necessary, prepare for shipment, deliver, install, erect, and field test two identical diesel engines complete with all auxiliaries and accessories as indicated on the Contract drawings and specified herein for Drinkwater Pumping Station.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for work specified in this section to assure compliance with requirements and maintain records of quality control for the manufacturing and operations of the equipment including but not limited to the following:

- (1) Erecting Engineer

The Contractor shall provide the services for qualified Erecting Engineer to inspect the installation and perform field-testing of the engines.

- (2) Inspection

Inspection on delivery of all supplies and materials.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

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 C39.1 (1981; R 1992) Electrical Analog Indicating Instruments

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53-96 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM A 106-95 Seamless Carbon Steel Pipe for High-Temperature Service

ASTM A 181/A181M-95b	Carbon Steel Forgings, for General-Purpose Piping
ASTM A 234/A234M-96a	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM C 533-95	Calcium Silicate Block and Pipe Thermal Insulation
ASTM D 975-96a	Diesel Fuel Oils

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.3	(1992) Malleable Iron Threaded Fittings
ASME B16.5	(1988; Errata Oct 1988; B16.5a) Pipe Flanges and Flanged Fittings
ASME B16.11	(1991) Forged Fittings, Socket-Welding and Threaded

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(1993; Errata 1993) National Electrical Safety Code
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

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

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 6	(1993) Industrial Control and Systems Enclosures
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(1993) Flammable and Combustible Liquids
NFPA 37	(1994) Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 70	(1996; Errata #1) National Electrical Code

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE ARP 892	(1965; R 1988) DC Starter-Generator, Engine – General Specification for
SAE J537	(1994) Storage Batteries
SAE J1995	(1990; R 1995) Engine Power Test Code - Spark Ignition and Compression Ignition - Gross Power Rating

UNDERWRITERS LABORATORIES (UL)

UL 1236

(1994) Battery Chargers for Charging Engine-Starter Batteries

1.4 SYSTEM DESCRIPTION

1.4.1 General Requirements

Each engine shall be provided and installed complete and totally functional, with all necessary ancillary equipment including, but not limited to, air filtration, starting system, instrumentation, lubrication, fuel system, cooling system, and engine exhaust system. Each engine rating shall be in accordance with SAE J1995. The diesel engine pump drives shall be complete units with all components, accessories, and system interconnections coordinated, so that the complete assembly shall have the capabilities required, for proper operation with the pump specified under Section 15160 VERTICAL MIXED-FLOW PUMPS and the speed reducer specified in Section 15170 RIGHT ANGLE GEAR REDUCERS.

1.4.2 Performance Requirements

Service Requirements:		Continuous
Rated Capacity:	110% of maximum HP required	From the pump curves at specified speed plus power required by the accessories
Overload Capacity:	110% rated capacity for 2 hr in 24 consecutive hours	
Maximum Speed:		1,800 RPM

Characteristics of the pump load for the engine drive are described in the pump curves and pump plans included in SECTION 15160 – VERTICAL MIXED FLOW BUMPS.

1.4.3 Site Ambient Conditions

The site characteristics are as described in paragraph PROJECT/SITE CONDITIONS.

1.4.4 Arrangement

Each engine, as shown and specified, is to be used as the prime mover for the vertical pump. The engine shaft shall be connected to the reducer input shaft with a flexible coupling. The Contractor shall coordinate among the manufacturers of the diesel engine, gear reducer, and the pump manufacturer to ensure the compatibility of these components including, but not limited to, the proper fit of engine and reducer shafts, the interaction of major components, and control of safety and alarm signals. Fuel for each engine shall be supplied by an individual day tank located near the engine and in accordance with NFPA 37. A cooling system shall be used to maintain engine and lubricating oil temperatures at the temperatures recommended by the manufacturer. A starting system shall be furnished along with necessary accessories for engine start-up. Each engine shall have a completely independent lubrication system with an engine-driven primary pump.

1.4.5 Standard Products

Materials and equipment comprising the engine drive system shall be the standard products of manufacturers regularly engaged in the production of diesel engine pump drives and shall essentially duplicate products which have been used satisfactorily for at least two years prior to bid opening. An offer proposing an experimental engine,

one having a lesser or greater number of cylinders than the offers' standard production engines, or one without a demonstrated satisfactory service record as a full diesel engine operating not less than 2,000 hours a year, for a minimum of 2 years, at not less than 75 percent rated load, will be rejected. All products shall be new.

#### 1.4.6 Nameplates

Each major component shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment. As a minimum, nameplates shall be provided for the following items:

- a. Engines
- b. Pumps and pump motors
- c. Radiators
- d. Heaters
- e. Exhaust mufflers
- f. Day tanks

#### 1.4.7 Personnel Safety Devices

Exposed moving parts, parts that produce high operating temperatures, parts which may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. The safety devices shall be installed so that proper operation of the equipment is not impaired.

### 1.5 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

a. Data:

Diesel Engine; FIO.

Cooling System; FIO.

Submit equipment and performance data certifying that the engine and cooling system function properly in the ambient temperature specified. Submit manufacturer's standard catalog data including a description and depiction of each engine and all ancillary equipment in sufficient detail to demonstrate complete specification compliance. If standard catalog data does not contain sufficient detail to verify compliance, then the contractor shall submit supplementary support documentation to verify compliance. All data submitted shall be on the engine manufacturer's letterhead and signed by a representative or official of the manufacturer authorized to make technical representations of his company's products.

Dynamic Analysis of Engine, Pump, and Governor; FIO.

Submit dynamic analysis with supporting calculations.

On-Site Training; FIO.

Submit a letter giving the proposed date for conducting the on-site training course and the agenda of instruction, a description of the video taping service to be provided, and the kind and quality of the tape.

b. Drawings:

Layout and Shop Drawings; FIO.

Submit layout and shop drawings which includes the following:

- (1) Base-mounted equipment, complete with base and all attachments including anchor bolt template and recommended clearances for maintenance and operation.
- (2) Complete starting system.
- (3) Complete fuel system.
- (4) Complete cooling system.
- (5) Complete intake and exhaust systems.
- (6) Layout of relays, breakers, switches, and instrumentation provided and applicable single line and wiring diagrams with a written description of the sequence of operation.
- (7) Lubrication system complete including piping, pump(s), strainers, filters, heat exchangers for lube oil and turbocharger cooling, electric heater, controls, and wiring.
- (8) Layout of the engine control panel and alarm panel.
- (9) Engine lifting points and rigging instructions.
- (10) Alignment information for the engine, gearbox and pump specifying sequences, tolerances, and temperature change effects.

As-Built Drawings; FIO.

Submit as-built drawings accurately depicting the as-built configuration of the supplied, installed, and accepted diesel engine pump drive.

c. Statements:

Field Engineer; FIO.

Submit certification that the field engineer is qualified to perform the specified functions in accordance with paragraph FIELD ENGINEER.

Diesel Engine Pump Drive; FIO.

Submit written documentation that the products being supplied are appropriate for this diesel engine pump drive, including past performance of the drive on certain types of service, i.e., marine generators, pump drives, locomotives, metal shredders, etc., with a minimum operation of 2,000 hr per year of service with a

minimum of 2 years of qualifying service. The certification of the unit's speed, horsepower, and duty rating that forms the basis of the qualifying experience is required for acceptance and shall be within 30 percent of this drive's rating.

Welder Qualifications; FIO.

Submit a letter listing the welder-qualifying procedures for each welder, complete with all supporting data such as test procedures used, what was tested to, and a list of the names of all welders and their identification symbols.

Installation and Alignment Procedures; FIO.

Submit a copy of the manufacturer's installation and alignment procedures, including a detailed description of the manufacturer's recommended break-in procedure.

d. Test Reports:

Engine; FIO.

Submit a fully documented shop test report.

Submit the field test report, documenting all data for lubrication oil temperature and flow, cooling water temperature and flow, and compliance with specified performance criteria tested during the field tests.

e. Certificates:

Equipment and Installation; FIO.

Submit certificates of compliance for equipment and installation including official, signed statements from manufacturers and installation contractors certifying compliance with the requirements of paragraph REGULATORY REQUIREMENTS. The statements shall certify the item and quantity supplied and either the date of shipment or installation.

f. Operation and Maintenance Manual:

Diesel Engine; FIO.

Submit an Operation and Maintenance Manual detailing start-up and operating procedures, lubrication instructions, installation and alignment procedures, routine maintenance requirements and procedures, complete detailed procedures for disassembly and reassembly of the engine, parts list for all parts detailed, assembly plans of the engine showing all parts, suppliers for all parts, settings and adjustment for protective devices, and a list of all tools, handling devices, and spare parts furnished.

## 1.6 REGULATORY REQUIREMENTS

Design, fabrication, and installation of the equipment shall conform to the applicable national, state, and local codes. Documentation for conformance shall be submitted according to paragraph SUBMITTALS.

## 1.7 DELIVERY, STORAGE, AND HANDLING

Material and equipment shall be protected from weather, humidity, temperature variation, dirt, dust, and other contaminants during delivery and storage. Lifting, moving, and storage of the engine shall be per manufacturer's requirements.

## 1.8 PROJECT/SITE CONDITIONS

### 1.8.1 Site Environment Criteria

Maximum Air Temperature: 110 deg F

Minimum Air Temperature: -10 deg F

Installation Elevation: 325 ft above sea level

### 1.8.2 Field Measurement

Before performing any work, the installation site shall be visited and all details of the work verified. For new construction, plans and elevation plans shall be reviewed for adequacy. The Contracting Officer shall be notified in writing of any discrepancies.

## 1.9 MAINTENANCE

### 1.9.1 Spare Parts for Maintenance

To best serve the needs and interests of the Government, it is the intention of these specifications to secure a current engine which can be properly maintained and serviced without the necessity of the purchaser carrying extensive parts stocks, or being subjected to long periods of interrupted service due to lack of available parts. The Contractor shall specify the nearest permanent parts depot from which parts may be obtained in necessary quantities. The Contractor shall, however, supply the following items:

- a. 4 replacement air filter elements for each engine.
- b. 4 replacement fuel filter elements for each engine.
- c. 4 replacement oil filter elements for each engine.
- d. Complete gasket set for each engine.

### 1.9.2 Special Tools for Maintenance

One complete set of special tools required for maintenance shall be provided. Special tools are those that only the manufacturer provides for special purposes or to reach otherwise inaccessible parts. The tools shall be supplied complete with a suitable toolbox.

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

#### 2.1.1 Filter Elements

Fuel oil, lubricating-oil, and combustion-air filter elements shall be the manufacturer's standard type and be able to filter out particles down to a 25 to 40 micron size unless otherwise noted.

#### 2.1.2 Pipe (150 psi System and Under)

Pipe for sleeves, fuel/lube-oil, compressed air, coolant, exhaust, and miscellaneous uses shall comply with ASTM A 53, or ASTM A 106 steel pipe. Pipe smaller than 2 in. shall be Schedule 80. Pipe 2 in. and larger shall be Schedule 40.

- a. Flanges and flanged fittings: ASTM A 181, Class 150, or ASME B16.5.
- b. Pipe welding fittings: ASTM A 234, Grade WPB or WPC, Class 150 or ASME B16.11, 3,000 lbs.
- c. Threaded fittings: ASME B16.3, Class 150.
- d. Valves: MSS SP-80, Class 150.
- e. Gaskets: manufacturer's standard.

### 2.1.3. Temperature Gauges for Oil or Water Service

Manufacturer's standard flush-mounted, 4 in. minimum diameter dial size with standard operating point at 50 percent of the full gauge range. Gauge construction and materials shall be appropriate for the intended service.

### 2.1.4 Pressure Gauges

Manufacturer's standard flush mounted, 4 in. minimum dial diameter with standard operating point at 50 percent of the full gauge range. Gauge construction and materials shall be appropriate for the intended service.

## 2.2 DIESEL ENGINE

### 2.2.1 General

The engine shall be a complete, factory –assembled diesel unit, 2 or 4 cycle, compression-ignition type, for stationary applications and shall operate on No. 2-D diesel fuel conforming to ASTM D 975. The engine shall be naturally aspirated, turbocharged, or turbocharged-aftercooled. The engine rating shall be as specified in paragraph PERFORMANCE REQUIREMENTS. Engines shall be current models of a type in regular production and shall be complete with all devices specified or normally furnished with the engine. The engine and radiator shall be mounted on a fabricated steel common base.

### 2.2.2 Fuel Consumption

Engine fuel consumption shall not exceed the following maximum limits based on the conditions listed below:

2/4 load	.460 lbs/BHP/hr
3/4 load	.440 lbs/BHP/hr
4/4 load	.430 lbs/BHP/hr

### 2.2.3 Crankcase Pressure Relief Valve

A pressure relief valve shall be provided in the crankcase. The crankcase shall be vented in accordance with the manufacturer's recommendations, except the engine exhaust shall not be used as the venting system. Crankcase breathers, if provided on engines installed in either a building or enclosure, shall be piped to vent to the outside.

## 2.3 FUEL SYSTEM

### 2.3.1 General

The fuel system for each engine shall conform to requirements of NFPA 30 and NFPA 37. The fuel system shall include the following items.

### 2.3.2 Fuel Pump

Each engine shall be provided with an engine-driven, positive displacement engine fuel pump. The pump shall have the capacity to transfer fuel from the day tank at a rate in excess of maximum fuel consumption stated in paragraph FUEL CONSUMPTION, as well as supplying adequate pressure for the fuel injectors. A minimum of one duplex filter with a trans-flow changeover valve shall be supplied for each engine. The filter shall have inlet and outlet connections plainly marked. An indicating differential pressure gauge shall be provided across the filter. The filter shall be located on the inlet side of the fuel pump. The filter shall be capable of filtering out particles down to 25 micron size.

### 2.3.3 Strainer

A full flow strainer of the replaceable cartridge type shall be provided between the engine and the fuel tank, upstream of the duplex filter. An indicating differential pressure gauge shall be provided for upstream and downstream of the strainer. The strainer cartridge shall be capable of filtering out particles down to 125 micron size.

### 2.3.4 Safety Bypass Valve

A safety bypass valve shall be provided next to the pump isolation valve to prevent the buildup of excessive pressures if the discharge line or fuel pump filters become clogged. This bypass shall protect the fuel piping from over-pressurizing. The bypass valve relief line shall return the fuel to the engine day tank.

### 2.3.5 Day Tank System

#### 2.3.5.1 Day Tank

Each engine shall be provided with a day tank located next to the engine. Each day tank shall be fitted with a fuel supply line, fuel return line, local fuel fill port, direct reading liquid level indicator, vent, fill limit float switch assembly for automatic control of the fuel oil transfer pump and a drain line. Each day tank shall have 75 gallon capacity. The tanks shall be of welded construction of not less than 11 gage (1/8-inch) steel and be built in accordance with the applicable requirements of NFPA Standard No. 30 for aboveground atmospheric tanks. The tanks shall be epoxy coated inside and be rustproofed and finish painted outside.

#### 2.3.5.2 Fuel Oil Transfer Pumps

The fuel oil transfer pumps to supply fuel oil to the day tanks shall be furnished and installed on the day tanks. The pumps shall be approved by Underwriter's Laboratories, Inc. or by a similar agency approved by the Contracting Officer. The pumps shall be electrically driven, positive displacement, gear or vane rotary type with mechanical seals. Bearings shall be of a material which will not be damaged by continuous contact with the fuel oil. The pumps shall have a minimum suction lift of twenty feet with a minimum delivery rate of 2 gallons per minute while pumping Grade No. 2-D diesel fuel, with a viscosity of 100 SSU at an operating pressure of 50 psig. The pumps shall be driven by a direct coupled electric motor rated ¼ hp minimum. The motor starter shall be furnished by the Contractor and mounted in the station control center as shown on the drawings.

#### 2.3.5.3 Hand Pumps

A piston-type hand pump shall be furnished and mounted on each day tank for the purpose of priming the system. The hand pump shall have a capacity of not less than 1 gallon per minute.

#### 2.3.5.4 Drain Line

Each day tank drain line shall be equipped with a shutoff valve and be arranged to allow drainage fuel into the drain tank.

#### 2.3.5.5 Local Fuel Fill

Each local fill port shall have a screw-on cap. An air vent with brass screen shall be provided so that the day tank does not develop a vacuum leading to the collapse of the day tank as the system empties.

#### 2.3.5.6 Fuel Level Limit Devices

Each day tank shall be provided with a fill level float switch assembly device to initiate refueling of the day tank at the low level mark, (e.g., 30 percent volume remaining) and stop refueling of the day tank at the high level mark, (e.g., 90 percent volume).

#### 2.3.5.7 Fuel Oil Strainer

A Y-type strainer shall be furnished and installed on each day tank inlet as shown on the contract drawings. The strainers shall have a strainer opening size of 80 mesh screen.

#### 2.3.5.8 Arrangement

The day tank shall be positioned and arranged so that fuel level in the day tank at the day tank empty level is above the suction port of the engine-driven fuel pump. The day tank overflow connection shall be positioned and arranged so that the highest possible fuel level in the day tank is below the fuel injectors. The fuel supply line from the day tank to the engine connections shall be welded steel pipe. A water drain shall be provided at the low point of the day tank.

#### 2.3.6 Fuel Supply System

The diesel fuel supply from the main diesel fuel storage to the day tank shall be as specified in Section 13202 - FUEL OIL DISTRIBUTION SYSTEM.

### 2.4 LUBRICATION

#### 2.4.1 Lube-Oil System

Each engine shall have a separate lube-oil system conforming to NFPA 30 and NFPA 37. Each system shall be pressurized by engine-driven pumps. A sump tank shall be furnished as required. The lube-oil pump shall draw oil from the oil pan or sump tank through a mesh intake strainer and force it through a lubricating oil cooler and a single or duplex full-flow strainer into the engine. The pump shall be protected by a relief valve to bypass the oil into sump. A portion of the oil from the sump shall be bypassed through a lubricating oil filter and back into the engine oil pan or sump. The lubricating oil temperature shall be regulated by means of an automatic temperature regulator which will control the amount of bypass oil around the cooler. The system shall be readily accessible for service such as draining or refilling. Each system shall permit the addition of oil and have oil-level indication with the unit operating.

#### 2.4.2 Lube Oil Pump Filters

One full-flow, duplex, 80 micron filter shall be provided for each pump. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked. An indicating differential pressure gauge shall be provided across the filter.

#### 2.4.3 Lubricating Oil Strainer

A full-flow, oil strainer shall be furnished in-line, ahead of the engine. The strainer shall be as recommended by the engine manufacturer. A bottom drain plug shall allow easy removal of the sludge.

## 2.5 COOLING SYSTEM

### 2.5.1 General

Each engine shall have its own cooling system. The system shall be of the closed type and operate automatically while the engine is running. The cooling system shall have two engine-driven water pumps, a split-core, air-cooled radiator and automatic temperature regulating valves. The maximum temperature rise of the coolant across each engine shall not exceed the engine manufacturer's recommendation. The engine cooling system shall be of the closed type arranged to prevent rust and minimize formation of scale deposits within the engine. The system shall circulate jacket-coolant through the engine at the temperature and flow rate recommended by the engine manufacturer. The coolant shall be an ethylene-glycol water mixture with a concentration sufficient for freeze protection at the minimum outdoor temperature specified.

### 2.5.2 Coolant Pumps

Engine-driven jacket water pumps shall be of the centrifugal type. The pumps shall be bronze fitted, single stage type with removable seal rings and stuffing box and properly sized for the intended purpose. An auxiliary engine driven water pump shall be furnished for pumping water between the separate core in the radiator and the gear reducer heat exchanger.

### 2.5.3 Radiator

Each radiator shall be sized to limit the maximum allowable temperature rise on the coolant across the engine to that recommended for the maximum outdoor design temperature and site elevation. Radiator fabrication materials shall be corrosion resistant and suitable for service in the ambient application conditions. The radiator may be factory coated with corrosive resistant film provided that corrective measures are taken to restore the heat rejection capability of the radiator to the initial design requirement via over-sizing or other compensating methods. Internal surfaces shall be compatible with liquid fluid coolant used. Materials and coolant are subject to approval by the Contractor Officer. Radiators shall be the pressure types incorporating a pressure valve, vacuum valve, and a radiator cap. Radiator caps shall provide for pressure relief prior to removal. Each radiator and the entire cooling system shall be capable of withstanding a minimum pressure of 7 psig. Each radiator shall be protected with a strong grille or screen guard. Radiators shall have at least two tapped holes. One tapped hole in the radiator shall be equipped with a drain cock; the rest shall be plugged. A separate core in the radiator will be used to cool the gear reducer coolant.

### 2.5.4 Thermostatic Control Valve

A modulating type, thermostatic control valve shall be provided in the coolant system to maintain the engine coolant temperature. A separate thermostatic valve will be used to meter flow to the gear in order to control gear oil temperature

### 2.5.5 Ductwork

The ductwork between the engine radiator and exhaust louver shall be galvanized steel and conforming to the requirements of SMCNA. A flexible connection shall be used to connect the radiator to the ductwork. Material for the connection shall be wire-reinforced fiberglass. The connection shall be airtight.

## 2.6 AIR INTAKE EQUIPMENT

Filters and silencers shall be provided in locations that are convenient for servicing. The silencer shall be of the high-frequency filter type, located in the air intake system as recommended by the engine manufacturer. A combined filter

silencer unit meeting requirements for the separate filter and silencer items may be provided. Expansion elements in air-intake lines shall be copper.

## 2.7 EXHAUST SYSTEM

### 2.7.1 General

The system shall be separate and complete for each engine. Exhaust piping shall be supported to minimize vibration. Provisions shall be made for pipe thermal expansion. The exhaust connectors shall incorporate engine-mating and silencer-mating flanges, eliminating the need for adapters. The muffler and exhaust piping together shall have not more than residential noise level rating.

### 2.7.2 Flexible Sections

A flexible section shall be provided at each engine. Flexible sections shall have flanged connections. Flexible sections shall be multiple-ply stainless steel expansion bellows type with standard 3 in. allowable axial expansion. Elements in the flexible sections shall be capable of absorbing vibration from the engine and compensating for thermal expansion and contraction.

### 2.7.3 Exhaust Muffler

A chamber type exhaust muffler shall be provided. The muffler shall be fabricated of welded steel and designed for outside vertical mounting. Eyebolts, lugs, flanges, or other items shall be provided as necessary for support of the muffler in the location and position indicated on the plans. The pressure drop through the muffler shall not exceed the recommendations of the engine manufacturer. Outside mufflers shall be fabricated from stainless steel. The muffler shall have a drain valve, nipple, and cap at the low-point of the muffler. The muffler shall be supplied complete with any necessary soot boxes or inspection ports required for adequate operation and maintenance. The entire exhaust system shall be sized appropriately so that the operation of the engine is not affected by the exhaust system.

### 2.7.4 Exhaust Piping

All exhaust piping shall be not less than 7-gage (3/16-inch) stainless steel unless otherwise approved. Horizontal sections of the exhaust piping shall be sloped downward away from the engine to a condensate trap and drain valve. Changes in direction shall be made utilizing long radius fittings. Exhaust piping, mufflers, and silencers shall be insulated with ASTM C 533 calcium silicate insulation, minimum of 3 in. thickness or an appropriate thickness to limit the surface temperature to values below 175 deg F. Insulation shall be secured with not less than 0.375 in. width Type 304 stainless steel bands spaced no farther apart than 8 in. on center. An aluminum jacket encasing the insulation shall be provided. The aluminum jacket shall have a minimum thickness of 0.016 in. with a factory-applied polyethylene and kraft paper moisture barrier. The jacket shall be secured with not less than 0.5 in. wide stainless steel bands, spaced no farther apart than 8 in. on centers. Longitudinal and circumferential seams of the jacket shall be lapped not less than 3 in. Jackets on horizontal lines shall be installed so that the longitudinal seams are on the bottom side of the pipe. The seams of the jacket for the vertical lines shall be placed on the off-weather side of the pipe. On vertical lines, the circumferential seams of the jacket shall overlap so that the lower edge of each jacket overlaps the upper edge of the jacket below. When the exhaust pipe exits the building, the pipe should be isolated from the wall by means of thimbles in accordance with NFPA 37.

## 2.8 EMISSIONS

The finished installation shall comply with Federal and local regulations and restrictions regarding the limits of emissions such as carbon monoxide, hydrocarbon, and nitros.

## 2.9 STARTING SYSTEM

### 2.9.1 Electrical Starting System

Each diesel engine shall be provided with an electrical starting system. The starter shall be the solenoid-shift, pinion gear type which will disengage automatically when the engine starts. The starting system shall be the manufacturer's standard equipment. Starting system will operate on 24 volts DC utilizing a negative ground. An adjustable cranking device should be included to limit the engine cranking to a specified time limit. Starting motors shall be in accordance with SAE ARP 892.

### 2.9.2 Battery System

A starting battery system shall be provided and include the batteries, battery rack, intercell connectors, spacers, automatic battery charger with overcurrent protection, metering, and relaying. The batteries shall be in accordance with SAE J537. The battery shall be a nickel-cadmium type, with sufficient capacity, at the minimum outdoor and indoor temperature specified, to provide a minimum cranking cycle consisting of three cranking periods of up to 8 seconds per period with 8-second intervals between crank periods. The battery rack shall be mounted on the engine skid.

### 2.9.3 Battery Charger

A current-limiting battery charger, conforming to UL 1236, shall be provided to automatically recharge the batteries. The charger shall be capable of providing both automatic float charging and equalizing charging of the battery installation. The charger shall be capable of recharging fully depleted batteries within 8 hr and providing a floating charge rate for maintaining the batteries in a fully charged condition. An ammeter and voltmeter shall be provided on the charger to indicate charging rate and voltage. The charger shall have alarm functions providing indications of low battery voltage, high battery voltage, and battery charger malfunction.

### 2.9.4 Jacket-Coolant Heaters

Thermostatically controlled electric heaters shall be mounted in the engine coolant jacketing to automatically maintain the coolant within  $\pm 10$  deg of the control temperature. The heater shall operate independently of engine operation so that starting times are minimized, condensation is controlled, and the system ensures dependable, cold weather starts. Power supply for the heaters will be 230 volts AC.

## 2.10 GOVERNOR AND CONTROLS

### 2.10.1 Speed Regulating Governor

Each engine shall be provided with a governor to control the rotational speed of the engine in response to changing load requirements. The governor shall be configured for safe manual adjustment of the speed during operation of the engine, without special tools. The engine governor shall maintain close speed regulation under all load conditions. The speed variation shall not exceed 6 percent of normal speed when full load is suddenly applied or removed. The design of the governor shall be such that the engine speed may be changed by governor adjustment during engine operation to any speed between 80 and 100 percent of the normal speed (corresponding to normal operating pump speeds) within 2 percent. The speed fluctuation at any load shall not exceed 2 percent. A raise/lower speed control shall be mounted on the engine control panel.

### 2.10.2 Emergency Overspeed Governor and Load Limit

An emergency governor with overspeed trip shall be provided on each engine to shutdown the unit should the speed exceed a predetermined RPM. The overspeed trip shall also provide an alarm signal for remote indication. The

emergency governor shall be independent of the regulating governor. When the overspeed stop has been tripped, the shutdown mechanisms shall be such that the engine fuel or air supply is prevented in the shortest time practicable from entering the engine cylinders. The trip mechanism may be part of the governor. The engine shall have an overload fuel limit set at 110 percent of the full load specified in paragraph DIESEL ENGINE.

### 2.10.3 Emergency Shutdown

In addition to the overspeed shutdown conditions specified, the engine controls shall be arranged to automatically close the fuel racks and shut down the engine, in the shortest practicable time, when either oil pressure falls below or jacket water temperature exceeds a safe limit.

### 2.10.4 Normal Shutdown

The engine controls shall be arranged such that, during a normal shutdown, the engine will slow down to an idle setting, idle at this speed for a predetermined time, and then automatically shutdown. A normal shutdown shall be initiated by either a signal from the water low-level float or by manual operation of the "DELAYED STOP" pushbutton located on the engine control panel. A "STOP" pushbutton shall also be provided for manually shutting down the engine instantly. Controls shall be configured such that engine cannot be started unless the high-level float switch is closed.

## 2.11 ENGINE CONTROL PANEL

### 2.11.1 General

Each engine shall be furnished with an electronic monitoring control panel. Each panel shall be of the type and kind necessary to provide specified functions. Panels shall be mounted on the engine or base by vibration/shock absorbing type mountings. Instruments shall be mounted flush or semiflush. Instruments shall be calibrated using recognized industry calibration standards. Each panel shall be provided with a panel identification plate which clearly identifies the panel function as indicated. Each instrument and device on the panel shall be provided with a plate which clearly identifies the device and its function as indicated. All instruments and devices shall be vibration resistant. The control panel shall have, as a minimum, the following outputs and controls, and shall be suitable for operation on the DC battery supply voltage:

- a. Engine Speed
- b. Fuel Oil Pressure
- c. Lube Oil Pressure
- d. Jacket Water Temperature
- e. Visual lamps and audible alarm for fuel pressure, lubricating oil pressure, and jacket water temperature.
- f. Running Time Meter
- g. Emergency Stop Button
- h. Normal Stop Button
- i. Start Button

### 2.11.2 Enclosures

Enclosures shall be designed for the application and environment, conforming to NEMA ICS 6.

### 2.11.3 Electronics

Analog or electrical indicating instruments shall be in accordance with ANSI C39.1 with semiflush mounting. Panel-mounted instruments shall be the manufacturer's standard. The instrument's operating temperature range shall be -4 to +150 deg F. Electronic indicating instruments shall be 100 percent solid state, state-of-the-art, microprocessor controlled to provide all specified functions. Control, logic, and function devices shall be compatible as a system,

sealed, dust and water tight, and shall utilize modular components with metal housings and digital instrumentation. An interface module shall be provided to decode serial link data from the electronic panel and translate alarm, fault, and status conditions to a set of relay contacts. Instrument accuracy shall be not less than 2 percent for unit mounted devices throughout a temperature range of -4 to +150 deg F. Data display shall utilize LED or backlit LCD. Additionally, the display shall provide indication of cycle programming and diagnostic codes for troubleshooting. Numeral height shall be 0.5 in. Continuous indication of the tachometer, lubricating-oil pressure, and safety system parameters shall be provided.

## 2.12 BASE

The base shall be constructed of structural steel. The base shall be designed to rigidly support the engine, ensure permanent alignment of all rotating parts, be arranged to provide easy access to allow changing of lube-oil, and ensure that alignment is maintained during shipping and normal operation. The base shall not permit skidding in any direction during installation and shall withstand and mitigate the effects of synchronous vibration of the engine and pump. The base shall be provided with suitable holes for anchor bolts.

## 2.13 PAINTING

The engine and the accessory equipment including, but not limited to, panels, valves, piping, intake, and exhaust system components shall be cleaned, primed, and factory painted with gray enamel.

## 2.14 FACTORY INSPECTION AND TESTS

Prior to shipment, each engine shall be inspected and tested at the factory in the presence of the Contracting Officer or the authorized government representatives. The inspection shall cover all components including, but not limited to, governors, instrumentation panels, engine starting system, intake and exhaust, lubrication system, cooling system, and fuel system. Inspection shall be completed and all necessary repairs made prior to testing. Unless otherwise directed by the Contracting Officer or the authorized government representative, the following factory tests shall be performed:

- a. Simulated emergency or overspeed trip test.
- b. Sustained operation test of 4 hr at rated full load.
- c. Sustained operation test of 2 hr at 75 percent of rated full load.
- d. Fuel consumption tests of not less than 1 hr each at 50, 75 and 100 percent rated full load, respectively, using diesel fuel specified.
- e. The engine shall be operated at no load to demonstrate that the governor and its associated engine manifold shutoff valve function properly.

Test data shall be taken at 30-min intervals and recorded on the manufacturer's diesel engine test data sheets. The test data sheets shall provide entries for all data required for the evaluation of diesel engine performance. The test data shall be submitted for approval as required in paragraph SUBMITTALS. No engine shall be shipped until the test data has been approved by the Contracting Officer.

## PART 3 EXECUTION

### 3.1 INSTALLATION

The installation of the equipment furnished under this section and related pumps and gear reducers under other sections shall be coordinated and installed in accordance with the approved installation procedures specified and submitted per the requirements of paragraph SUBMITTALS.

### 3.2 PIPING INSTALLATION

#### 3.2.1 General

No section of pipe within a building shall exceed 20 ft in length between flanged fittings. Except where otherwise specified, flanged fittings shall be utilized to allow for complete dismantling and removal of each piping system from the facility without disconnecting or removing any portion of any other system's equipment or piping. Connections to all equipment shall be made with flexible connectors and isolation valves. Bending of pipe shall be done with pipe benders, and no malformation shall be visible on bent pipe. Pipes extending through the roof shall be properly flashed. Piping shall be supported and permitted to expand and contract without damage to joints or hangers. Drain valves of 0.6 in. shall be installed at each low point in the piping.

#### 3.2.2 Supports

Hangers, inserts, and supports shall be of sufficient size to accommodate any insulation and shall conform to MSS SP-58 and MSS SP-69. Supports shall be spaced in accordance with ASME B31.1.

#### 3.2.3 Flanged Joints

Flanges shall be Class 125 type, drilled, and of the proper size and configuration to match the exhaust outlet of the engine. Flanged joints shall be gasketed and made to be square and tight.

#### 3.2.4 Cleaning

After fabrication and before assembly, all piping interiors shall manually be wiped clean of all debris.

### 3.3 ELECTRICAL INSTALLATION

Electrical installation shall comply with NFPA 70, IEEE C2, and Section 16415 ELECTRICAL WORK, INTERIOR.

### 3.4 ON-SITE INSPECTION AND TESTS

#### 3.4.1 General

The tests outlined in the subsequent subparagraphs shall be performed after complete installation of each engine and its associated equipment. Data taken during runs shall be recorded at 30-min intervals and shall include all available pressure and temperature data which is monitored by the instrumentation furnished with the engine. The Contractor shall provide all equipment and supplies required for the inspections and tests including fuel and test instruments.

#### 3.4.2 Sequence

The tests shall follow the sequence outlined in subsequent paragraphs. Measurements shall be made and recorded of all parameters necessary to verify that each engine meets specified parameters. If the results of any of the test

sequences are not satisfactory, adjustments or replacements shall be made and the test sequence repeated until satisfactory results are obtained.

#### 3.4.3 Piping Test

- a. Lube-oil and fuel-oil piping shall be flushed with the same type of fluid intended to flow through the piping, until the out-flowing fluid is free of obvious sediment and emulsions.
- b. The lube oil, fuel-oil and coolant piping shall be hydrostatically pressure tested at 150 percent of the maximum anticipated working pressure, but in no case less than 150 psig for a period of 2 hours to demonstrate the piping has no leaks. If piping is to be insulated, the test shall be performed before the insulation is applied.

#### 3.4.4 Initial Inspection

- a. Engine mounting bolts shall be visually inspected and checked for proper application and torque.
- b. Correct functioning of the high lubricating oil temperature circuit shall be demonstrated by removing the temperature-sensing elements from the engine and immersing the elements in a vessel containing controlled-temperature hot oil and recording the temperature at which the elements activate.
- c. Correct functioning of the high coolant-fluid outlet temperature circuit shall be demonstrated by removing the temperature-sensing elements of the circuit from the engine and immersing the elements in a vessel containing controlled-temperature hot coolant-fluid and recording the temperature at which the elements activate.

#### 3.4.5 Electric Protective Device Tests

Protective devices shall be visually and mechanically inspected, adjusted, tested, and calibrated in accordance with the manufacturer's published instructions. Device ratings, settings, and other operational data shall be documented.

#### 3.4.6 Safety Run Test

The safety run test consists of the following sequence of tests:

- a. The engine shall be started, the starting time recorded, and all of the engine manufacturer's recommended after-starting checks and inspections performed following a reasonable warm-up period.
- b. The engine shall be operated for at least 2 hr at 75 percent rated speed.
- c. Proper operation of all controls shall be verified.
- d. Proper operation and set points of all gauges and instruments shall be verified. Setpoints shall be recorded.
- e. Proper operation of all ancillary equipment shall be verified.
- f. The manual emergency stop switch shall be activated and the time to stop the engine recorded.
- g. The governor shall be manually adjusted to increase engine speed past the overspeed limit. The engine RPM at shutdown shall be recorded.
- h. The time-delay low-lube oil pressure alarm bypass shall be temporarily removed from the engine safety circuits and an attempt made to start the engine. The results shall be recorded.

- i. A manifold shall be attached to the engine oil system containing a shutoff valve in series with a connection for the engine's oil pressure sensor, followed by an oil pressure gauge, ending in a bleed valve. The oil pressure sensor shall be moved from the engine to the manifold and its normal location on the engine temporarily sealed. The manifold shutoff valve shall be placed in the open position and the bleed valve closed. The manifold shutoff valve shall be closed. The pressure in the manifold shall be slowly bled off through the bleed valve while observing the pressure gauge. The pressure at which the engine shuts down shall be recorded. The oil spillage from the bleed valve shall be captured in a container. The oil system shall be refilled, the manifold removed, and the engine's oil pressure sensor reinstalled on the engine following the test.
- j. The engine shall be started, the starting time recorded, the engine manufacturer's after-starting checks and inspections performed and recorded and the engine operated for at least 15 min at 100 percent of rated speed.

#### 3.4.7 Final Inspection

- a. The lube-oil filter shall be removed and the oil and filter examined by the engine manufacturer for excessive metal, abrasive foreign particles, and other indications of engine distress. Any corrective actions shall be verified for effectiveness by running the engine for 8 hr at full rated speed, then re-examining the oil and filter.
- b. The engine shall be inspected and all engine mounting bolts checked for tightness and visible damage.

### 3.5 MANUFACTURER'S FIELD SERVICE

#### 3.5.1 On-Site Training

The Contractor shall conduct training courses for the plant 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 commence after the system is functionally completed, but prior to final acceptance. The course instructions shall cover pertinent points involved in operating, starting, stopping, and servicing the equipment, as well as all major elements addressed in the operations and maintenance manuals. Additionally, the course shall include demonstrations and instruction in all routine maintenance operations including oil change, oil filter change, air filter change, etc.

#### 3.5.2 Field Engineer

The manufacturer or contractor shall furnish a qualified engineer to supervise the complete installation of the engine, assist in performance of the onsite tests, and instruct personnel regarding operational and maintenance features of the equipment.

### 3.6 FIELD PAINTING

After completion of installation and all field tests, the engine's painted finish will be cleaned and touched-up with paint matching the factory paint system.

### 3.7 ACCEPTANCE

Final acceptance of the engine will not be made until the Contractor has successfully completed all tests, corrected all defects in installation material, and/or installation procedures, and all deficiencies identified in on-site testing or routine operation have been corrected.

-- End of Section --

DIVISION 15 - MECHANICAL

SECTION 15170

RIGHT ANGLE GEAR REDUCERS

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DIVISION 15 – MECHANICAL

SECTION 15170

RIGHT ANGLE GEAR REDUCERS

PART 1 GENERAL

1.1 SCOPE

The work covered under this section of the specifications consists of furnishing all plant, labor, equipment, material and performing all operations required to design, manufacture, assemble, factory test, install and field test two (2) identical right angle gear reducers, complete with all accessories and appurtenance as specified herein.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for work specified in this section to assure compliance with requirements and maintain records of quality control for the manufacturing and operations of the equipment including but not limited to the following:

(1) Field Engineer

The Contractor shall provide the services of a qualified Field Engineer to inspect the installation and perform field-testing of the right angle gear reducers.

(2) Inspection

Inspection on delivery of all supplies and materials.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

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 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 GEAR MANUFACTURERS ASSOCIATION (AGMA)

AGMA 6010-E 1988; Errata Nov 1991) Standard for Spur, Helical, Herringbone, and Bevel Enclosed Drives

AGMA 6023-A (1993) Design Manual for Enclosed Metric Module Gear Drives

AGMA 6025-C

(1990) Standard for Enclosed Helical, Herringbone, and Spiral Bevel Gear Drives

NATIONAL FLUID POWER ASSOCIATION (NFLPA)

NFLPA

(1990 R 1994) Hydraulic Fluid power Filters Multi-Pass Method for evaluating Filtration Performance

## 1.4 GENERAL REQUIREMENTS

### 1.4.1 Standard Products

Materials and equipment shall be the standard products of manufacturers regularly engaged in the production of gear reducers for vertical pump drives and shall essentially duplicate products which have been in prior satisfactory use for at least 2 years prior to bid opening. All products shall be new.

## 1.5 SYSTEM DESCRIPTION

### 1.5.1 General Product Requirements

The speed reducers shall be designed and manufactured by a firm that is regularly engaged in the manufacture of speed reducers of the type utilized for these installations. The reducer shall display the certified manufacturer's AGMA insignia as evidence of conformance to these standards. The nameplate shall bear the manufacturer's name, model designation, serial number, unit rating, application factor, reduction ratio, and other applicable information. The speed reducer shall be the spiral bevel gear type equipped with thrust bearings to make the speed reducer suitable for use with a vertical impeller pump. Where upthrust is possible during pump startup or shutdown, the thrust bearing shall be designed to resist this load. The speed reducer shall be able to withstand all of the specified operating conditions without damage. A backstop shall be provided to prevent reverse rotation of the pump. The gear reducer shall conform to the requirements of AGMA 6010-E or AGMA 6023-A.

### 1.5.2 Design Conditions

#### 1.5.2.1 Operating Conditions

The Contractor shall obtain the operating conditions from the pump and prime mover suppliers. Operating conditions which shall be considered include (as a minimum): maximum input power, engine speed, speed reducer ratio, maximum pump reverse overspeed, low-speed shaft downward thrust including weight, low-speed shaft momentary upward thrust during startup or shutdown (if applicable), high-speed shaft direction of rotation, low-speed shaft direction of rotation, overhung load, maximum engine overload torque, and reverse torque load on the backstop. The speed reducer shall be designed to withstand backstop failure and maximum pump reverse runaway speed for a period of 30 minutes.

#### 1.5.2.2 Critical Speeds

Dynamic analysis of the pump, reducer, and engine assembly shall be performed by the pump manufacturer. The reducer manufacturer shall coordinate with the pump manufacturer in performing the dynamic analysis. The gear reducer manufacturer shall make any design modifications to the reducer which are necessary to avoid resonances in the system. A torsional or lateral natural frequency within 25 percent of normal operating speed of any shaft or gear mesh frequency is unacceptable.

### 1.5.3 Arrangement

The arrangement shall use a true hollow low-speed shaft where the pump shaft passes concentrically through the reducer shaft allowing finite impeller elevation adjustment. The speed reducer output shaft shall be connected to the

pump using a rigid coupling. The speed reducer input shaft shall be connected to the engine with two flexible couplings and an intermediate shaft. The Contractor shall ensure compatibility and fit of the reducer high- and low-speed shafts with that of the pump and prime mover. The speed reducer mounting shall be designed to permit removal of the reducer and reinstallation without requiring realignment of the reducer and shafting. Before assembly, each gear and shaft assembly shall be dynamically balanced.

## 1.6 SUBMITTALS

The Contractor shall submit the following information on the gear reducer he proposes to furnish. Government approval is required for all submittals with a "FIO" designation; submittals having an "FIO" designation are for information only.

(1) Data:

- System Description; FIO.
- Bearings; FIO.
- Gears; FIO.
- Shafts; FIO.
- Backstop; FIO.
- Housing; FIO.
- Lubrication System; FIO.
- Instrumentation; FIO.
- Speed Reducers and Related Lubricating and Auxiliary Equipment; FIO.
- Lubricant; FIO.

Complete computations, design loads, and catalog data.

(2) Drawings:

- Reducer Drawings; FIO.
- Lubrication System; FIO.
- Instrumentation; FIO.

Detail drawings of sufficient size for easy reading and consisting of 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 show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of work including clearances for maintenance and operation.

(3) Reports:

- Shop Testing; FIO.
- Field Testing; FIO.

A shop test report fully documenting the test.

A field test report documenting all data for load and speed measurement, lubrication oil temperature and flow, cooling water temperature and flow, gear contact patterns, adjustment of component settings, and otherwise showing compliance with specified performance criteria.

(4) Manuals:

- Operation and Maintenance Manual; FIO.

The Operation and Maintenance Manual shall provide detailed startup and operating procedures, lubrication instructions, installation and alignment procedures, routine maintenance requirements and

procedures, complete detailed procedures for disassembly and assembly of the reducer, parts list for all parts detailed, assembly drawings of the reducer showing all parts, suppliers for all parts, settings and adjustment for protective devices, and a list of all tools, handling devices, and spare parts furnished.

## PART 2 PRODUCTS

### 2.1 GENERAL

The reducer assembly shall be rated in accordance with AGMA 6010-E or AGMA 6023-A as applicable. The unit rating shall be equal to or exceed the maximum input power times an application factor. The application factor shall be 1.5 for reducers driven by diesel engines.

### 2.2 BEARINGS

#### 2.2.1 Thrust Bearings

Thrust bearings shall be antifriction type. Antifriction thrust bearings shall be either tapered roller or spherical roller type. The thrust bearing shall be sized for the pump thrust plus the weight of the impeller and shaft. The thrust bearing size and arrangement shall be coordinated with the pump supplier. The bearings shall be able to sustain continuous operational load as well as startup and shutdown loads.

#### 2.2.2 Radial Bearings

Radial bearings for spiral bevel and parallel shaft reducers shall be antifriction type.

#### 2.2.3 Antifriction Bearings

Antifriction bearings shall be rated for an L-10 life of 100,000 hours at the operating load of the reducer. Ball bearing load ratings shall conform to ABEMA 9. Roller bearing load ratings shall conform to ABEMA 11.

### 2.3 GEARS

Right angle gearing shall be of the spiral bevel design. Spiral bevel gears shall be gas nitrided or carbonized, hardened and ground. The pinion or gear of each helical set shall be crowned to eliminate end loading. In addition to rating the gears according to AGMA 6010-E or AGMA 6023-A as applicable, gear stresses shall not exceed 80 percent of yield strength for any engine overload condition.

### 2.4 SHAFTS

Each shaft shall be heat-treated alloy steel. Input shaft size and configuration shall be compatible with the engine. Output shaft size and configuration shall be compatible with the pump. Welded shafts are not acceptable.

### 2.5 FLEXIBLE COUPLINGS

The speed reducer shall be connected to the engine by two flexible couplings with an intermediate shaft. The flexible couplings shall have a service factor of 2 based on maximum rated load. In addition, at maximum overload conditions, stresses shall not exceed 80 percent of yield strength. Couplings shall transmit torque by means of a steel grid spring fitted into grooves in the periphery of the coupling hubs, by flexible steel discs, or by means of external gears on hubs engaging in internal gears on the coupling sleeves or by hubs engaged with flexible self-lubricating members. Couplings with sleeves held in place by snap rings are not acceptable. The angles between

each shaft and the intermediate shaft shall be equal and shall not exceed the manufacturer's recommendation. Couplings shall be enclosed and sealed to exclude contaminants and retain the lubricant under both static and operating conditions. The couplings shall be dynamically balanced to AGMA balance classification 7 or better and shall be grease lubricated unless self-lubricated.

## 2.6 BACKSTOPS

A backstop shall be provided on the output shaft to prevent reverse rotation of the pump. The backstop shall be sized for the resulting torque at the reducer during maximum reverse flow at pump and a service factor of 2.0 shall be applied to the manufacturer's published rating. In addition the backstop shall be suitable for continuous operation at engine idle speed. The backstop shall be of a drop-pin type. The backstop shall be mounted with the outer race moving and the inner race fixed. The backstop shall operate at a temperature of less than 160 degrees F under all operating conditions with an ambient temperature up to 100 degrees F.

## 2.7 HOUSING

### 2.7.1 General

The housing shall be cast or fabricated steel, stress relieved prior to machining, and reinforced to carry all applied loads and to maintain gear alignment. The housing shall be rigidly bolted to the reducer baseplate. It shall have a minimum of four jack bolts to facilitate alignment. The housing bottom shall be machined. The interior of the reducer shall be painted with an oil compatible coating. The exterior shall be painted with the manufacturer's standard coating system. Color shall be gray. The housing shall have an oil fill connection and a drain connection with a magnetic plug. Lifting lugs shall be provided for lifting the entire reducer assembly and any subassembly or component which cannot be lifted using web slings.

### 2.7.2 Seals

Vertical down output shafts shall have a drywell design seal. The input shaft shall have a lip seal to prevent leakage of oil and exclude dirt. Lip seals shall utilize hardened steel wear sleeves to preclude shaft repair or replacement if the seal wears the shaft.

### 2.7.3 Inspection Covers

The housing shall have inspection holes with cover plates located above the maximum oil level to permit viewing of gear teeth allowing evaluation of the contact patterns of each gear mesh and to allow inspection of internal features of the lubrication system.

## 2.8 LUBRICATION SYSTEM

### 2.8.1 General

The speed reducer shall be provided with an oil lubrication system that will provide continuous lubrication to the gears and bearings. The system shall consist of an oil circulating pump, water-cooled heat exchanger, piping, oil filter, and controls. Each reducer shall be provided with its own system. The oil circulating pump shall be driven directly from the speed reducer shaft. The maximum oil sump temperature at rated speed and load shall be 160 degrees F at an ambient temperature of 110 degrees F. Water from the engine radiator will be circulated thru the heat exchanger. The lubrication system shall include an oil pressure gauge and an oil temperature gauge. The gauges shall have a minimum dial diameter of two inches.

### 2.8.2 Oil Pumps

The oil pumps shall be positive displacement type. Each pump shall have a relief valve which discharges to the sump. The pump shall be reversible so it continues to function during a runaway condition.

### 2.8.3 Oil Filter

The lubricating system shall have an oil filter on the pump outlet side. The filter shall have a Beta rating of B6 greater than 75 at 60 psi differential tested in accordance with NFLPA T3.10.8.8 R1. The reducer manufacturer may propose an alternate Beta rating by submitting proof that B6 greater than 75 is unsuitable for the lubricant to be used. Each filter shall incorporate an oil-filled differential pressure gauge to indicate the pressure drop across the filter. The filter shall have an internal magnetic element. Filter assemblies shall be sized so the pressure drop across the clean filter is no greater than 4 psi. The particle filter shall be sized to avoid bypass at a startup oil temperature of 80 degrees F. Filters shall have a bypass setting of 45 to 60 psi. Element collapse rating shall not be less than 150 psi.

### 2.8.4 Lubricating Oil

Lubricating oil shall be mineral oil or synthetic hydrocarbon as recommended in AGMA 6010-E or AGMA 6023-A for an ambient temperature range of 15 to 125 degrees F. The lubricant shall be suitable for the entire temperature range without change of lubricant. Lubricant additives shall be used as recommended by the reducer manufacturer. Catalog data of the proposed lubricant shall be submitted for approval in accordance with paragraph 1.6 entitled SUBMITTALS.

## PART 3 EXECUTION

### 3.1 TESTS, INSPECTIONS, AND VERIFICATIONS

#### 3.1.1 Shop Testing

In addition to or as part of the Contractor's normal shop testing procedure, the reducer shall be tested at rated speed, no load to check for potential problems which shall be eliminated prior to field-testing. Gear contact patterns, sound level, lubrication, and all other operational characteristics shall be checked. The sound pressure level of the speed reducer and prime mover used in the shop test shall not exceed 85 dBA measured at a distance of 1 m (3 feet) from the equipment. Sound shall be measured in accordance with AGMA 6025-C. The Contractor shall provide any preventative measures to control background noise. The Contractor shall notify the Contracting Officer 2 weeks prior to performing the shop test.

#### 3.1.2 Installation

The Contractor shall install the speed reducer and shall ensure all features and systems are operational. The speed reducer shall be installed under the supervision of the reducer manufacturer's representative. The speed reducer shall be designed for ease of handling and installation. All necessary lifting devices, attachments, and special tools required for maintenance shall be provided by the Contractor.

#### 3.1.3 Field Testing

The speed reducer shall be field tested at rated speed and load to demonstrate that reducer operation, lubrication, cooling, and instrumentation meet contract requirements. The duration of the testing shall be sufficient to develop verifiable gear contact patterns. Gear contact patterns shall be inspected and shown to the Contracting Officer. Gear contact patterns for helical gears shall be at least 70 percent of face width. Spiral bevel gears shall have a central toe contact pattern with contact of 50 percent of face width at full load. Gear contact patterns shall be photographed and included as part of the field test report. The report shall document all data collected for load and speed measurement, lubrication, oil temperature and flow, ambient temperature, gear contact patterns, and any other data required to show compliance with specifications.

-- End of Section --

DIVISION 15 - MECHANICAL

SECTION 15175

DISCHARGE PIPE AND APPURTENANCES

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DIVISION 15- MECHANICAL

SECTION 15175

DISCHARGE PIPE AND APPURTENANCES

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all shop drawings, plant, labor, materials and equipment and manufacturing, factory testing, coating, delivering, storing and installing the storm water pump discharge pipes complete with all necessary accessories and appurtenances, all as shown on the contract drawings and specified herein.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations, including but not limited to the following:

- (1) All shop fabrication.
- (2) Shop coating.
- (3) Use of specified material.
- (4) Shop tests.
- (5) Preparation for shipment and storage at the worksite.
- (6) Inspection at the worksite for damage to and defects in all material and equipment.
- (7) Storage at the worksite.
- (8) Field Coating.
- (9) Installation.
- (10) Maintenance after Installation.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS AND STANDARDS

AMERICAN WATER WORKS ASSOCIATION (AWWA)

C200-80

Steel Water Pipe 6 Inches and Larger

C203-78	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines-Enamel and Tape – Hot – Applied
C208-96	Dimensions for Fabricated Steel Water Pipe Fittings
MII-88	Steel Pipe Design and Installation

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 36-94	Structural Steel
ASTM D 1556-90 (R 1996)	Density and Unit Weight of Soil In Place by the Sand Cone Method
ASTM D 4253-93 (R 1996)	Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D 4254-91 (R 1996)	Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

#### FEDERAL SPECIFICATIONS (FS)

TT-P-38E	Paint, Aluminum, Ready-Mixed
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#### MILITARY SPECIFICATIONS (MS)

MIL-C-16173D	Corrosion Preventive Compound, Solvent Cutback, Cold-Application
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#### STEEL STRUCTURES PAINTING COUNCIL

SSPC Paint 25	Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments)
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## 1.4 SUBMITTALS

Complete shop drawings of the storm water pump discharge pipes, appurtenances and accessories shall be submitted to the Contracting Officer for approval in accordance with SP-4. Drawings of any items made specially or specifically for this project shall be true shop drawings, but catalog cuts will be sufficient for standard manufactured articles, and outline drawings of such equipment may be used in the assembly drawings. However, for those items for which true shop drawings are not required, sufficient descriptive data and/or other information, in addition to the catalog cuts, shall be submitted to demonstrate compliance with the specifications. The shop drawings shall show clearly all information required for connecting, coupling, coating, electrically bonding and installing the discharge pipes, appurtenances, and accessories, and shall specify the materials used.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Pipe

Pipe for the storm water pump discharge line shall be fabricated and tested in accordance with the applicable requirements of AWWA C200. Test pressure shall be not less than 30 pounds per square inch gage. The pipe shall have a nominal inside diameter of 36 inches and a minimum nominal wall thickness of 3/8 inch. The pipe shall have plain ends and thrust rod lugs to accommodate the flexible couplings.

## 2.1.2 Fittings

Fittings and specials for the discharge pipe shall be specially fabricated from the same material as the discharge pipe and in accordance with the approved shop drawings and the applicable provisions of AWWA C208. The elbows shall conform to the requirements indicated on the contract drawings and shall have the same diameter, thickness, and coating as the discharge pipe.

## 2.1.3 Flexible Couplings

Flexible couplings shall be the gasketed, sleeve type, of proper diameter to fit the discharge pipe, and shall be furnished complete with gaskets and bolts and the associated thrust rods and nuts. The middle ring of the coupling shall be a true circular section free from irregularities, flat spots or surface defects. It shall be fabricated into a one-piece element, with all longitudinal joints flush butt-welded. After welding, it shall be tested by being cold-expanded a minimum of one percent beyond the yield point to proof-test the weld to the strength of the parent metal. The weld shall then be subjected to an air test for porosity. The thickness of the middle ring shall be at least the nominal thickness of the discharge pipe. The middle ring shall not have a pipe stop. The followers shall be fabricated into one-piece elements from a contoured mill section by being flush butt-welded and then cold-expanded as required for the middle ring. The followers shall be of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressure. The shape of the followers shall be of such design as to provide positive confinement of the gasket. Coupling bolts shall be the elliptic-neck, track-head type with rolled threads. All bolt holes in the followers shall be oval for greater strength. Gaskets shall be composed of either a natural or synthetic rubber compounded with other products to produce a material which will not deteriorate from either age, heat or exposure to air under normal storage conditions. The compound shall also possess the quality of resilience and the ability to resist cold flow so that the joint will remain sealed and tight indefinitely when subjected to shock, vibration, pulsation and temperature changes in the discharge pipe.

## 2.1.4 Siphon Breakers

### 2.1.4.1 General

A siphon breaker shall be installed in each discharge pipeline at the location indicated on the drawings. Each breaker shall consist of a siphon breaker-air relief valve; manhole; manhole drain piping; and concrete outfall pad. The two siphon breakers shall be of identical materials and installation.

### 2.1.4.2 Siphon Breaker-Air Relief Valve

The siphon breaker air relief valve shall allow air to escape through the valve until the discharge pipe is full of water, at which time a vane located in the discharge flow stream shall move in the direction of flow, closing the valve and initiating siphonic action. When the pump stops, the reverse flow acting against the vane shall open the valve and break the siphon. All moving parts of the valve shall be of brass, bronze, or stainless steel. The valve body shall be galvanized cast iron. The valve seat material shall be neoprene. The support plate shall be black steel conforming to the requirements of ASTM A 36. The valve shall be a Harris Siphon Breaker - Air Relief Valve as manufactured by William P. Wilson & Sons, Kentucky St. at North Cleveland, Woodland, California 95695, or an approved equal. The valves shall be installed as indicated on the drawings. Ten copies of an operations and maintenance manual shall be furnished with the siphon breaker - air relief valves.

### 2.1.4.3 Manhole

The manhole shall be constructed from steel pipe, steel flange, and steel plate as indicated on the drawings. The 36-inch diameter steel manhole pipe shall conform to the requirements specified for the discharge pipe in 2.1.1 above. The steel flange and 42-inch diameter steel plate shall be black steel conforming to the requirements of ASTM A 36. The flange shall be welded to the 36-inch pipe and the plate shall be bolted to the flange as indicated. Galvanized steel insect screens shall be installed over the openings in the manhole in a manner satisfactory to the Contracting Officer.

#### 2.1.4.4 Manhole Drain Piping

Manhole drain piping shall be installed as indicated on the drawings. The 2-inch steel pipe shall be Schedule 40, black, seamless steel pipe conforming to the requirements of ASTM A 53 with appropriate fittings. Steel pipe shall be coated with either a shop-applied plastic sheath or a field or shop applied coal-tar coating and wrapping system applied in conformance to the applicable requirements of AWWA C 203. Where extruded polyethylene sheath is used for the protective coating, fittings and joints shall be covered in the manner and with the materials recommended by the manufacturer of the sheath.

#### 2.1.4.5 Concrete Outfall Pad

A concrete outfall pad shall be constructed with dimensions and location as indicated on the drawings. Concrete and placement thereof shall conform to the applicable requirements of SECTION 03301 – CAST-IN-PLACE STRUCTURAL CONCRETE.

## 2.2 COATINGS

The storm water pump discharge pipes shall be coated inside and out in the manufacturer's plant and in accordance with the applicable provisions of AWWA C203. All coatings shall be touched up in the field as necessary. The coating of pipe to be placed underground shall be finished with a coat of water-resistant whitewash. Any of the underground coating which remains exposed after installation of the discharge pipe and completion of the embankment work shall be given an additional coat of water-resistant whitewash equivalent to that applied at the factory. Flexible couplings shall be cleaned, primed and coated with coal tar enamel in accordance with the applicable provisions of AWWA C203 for "Specials", and the use of coupling coating pans or "cocoon" as described in AWWA Manual M11 will be acceptable. Any portions of the pipe and fittings not shop coated in order to facilitate assembly shall be thoroughly cleaned and coated in the field and in accordance with AWWA C203. The exposed portion of the steel base ring of the siphon breaker-air relief valve, the interior of the associated manhole, and the aboveground exterior of the manhole shall be painted with one coat of red iron oxide paint conforming to the requirements of SSPC Paint 25, and then painted with two coats of aluminum paint conforming to the requirements of TT-P-38. The underground portion of the manhole and base ring shall be coated and wrapped as specified for the discharge pipe. The Contractor shall furnish, under separate cover, an affidavit that the materials and workmanship comply with the applicable requirements of AWWA C203.

## PART 3 EXECUTION

### 3.1 ELECTRICAL BONDING

The storm water pump pipe sections, fittings and flexible couplings shall be electrically bonded as indicated on the contract drawings. Material used shall be as shown and be attached prior to coating the exterior of the pipe.

### 3.2 PREPARATION FOR SHIPMENT AND STORAGE

Protected pipe shall be handled at all times with equipment such as wide slings and wide padded skids designed to prevent damage to the coating. Bare wire rope, chains, hooks, metal bars and narrow skids shall not be permitted to come in contact with the coating. When shipped by rail, all pipe and couplings shall be carefully loaded on properly padded saddles or bolsters. All bearing surfaces and dunnage shall be properly padded with approved materials. Pipe sections and couplings shall be separated so that they do not bear against each other, and the whole load shall be securely fastened together to prevent movement in transit. The pipe shall be loaded and tied into a unit load, in strict accordance with the current loading rules of the American Railway Association whenever they are applicable. When shipped by truck, the pipe and couplings shall be supported in wide cradles of suitably padded timbers hollowed out on the supporting surface to fit the curvature of the pipe, and all wire rope, chains and other fastening equipment shall be carefully padded. Prior to being loaded on the carrier, any portions of the storm water pump discharge pipe not coated because of future field welding or other installation requirements shall be protected with a

coat of rust preventative meeting the applicable requirements of MS MIL-C-16173, Grade 2. This coating shall be removed prior to any field welding or coating.

### 3.3 STORAGE

Upon delivery at the worksite, the discharge pipe sections, accessories, appurtenances, fittings and the metal parts of the flexible couplings may be stored outdoors provided they are stored on wood blocking not less than 8 inches above a base of washed gravel or crushed stone not less than 2 inches thick. The gaskets shall be stored indoors.

### 3.4 FABRICATION AND INSTALLATION

#### 3.4.1 General

Except where flexible couplings are shown on the contract drawings, the storm water pump discharge pipe shall be shop assembled with welded joints and welded fittings. The pipe shall be in lengths not to exceed 45 feet. The pipe shall be handled and transported in such manner that neither the pipe nor the coatings will be damaged. The bottom of the trench shall be so shaped and compacted that each section of pipe will rest on a foundation of uniform density. Excavation and backfill shall be as specified in SECTION 02221 – EXCAVATION, and SECTION 02222 BACKFILLS AND EMBANKMENT. Space shall be provided to accommodate the larger diameter of the flexible couplings. The transition section which connects the storm water pump to the remainder of the discharge line shall be formed into the pumping station wall in accordance with the applicable provisions of SECTION 03301 – CAST-IN-PLACE STRUCTURAL CONCRETE. Where the discharge pipe is embedded in a wall, anchor rings shall be provided. The size, thickness and attachment shall be as shown on the contract drawings. Flexible couplings shall be installed in accordance with the manufacturer's instructions, including recommended bolt torques, and in such manner as to secure permanently tight joints under all reasonable conditions of expansion, contraction, shifting and settlement. Thrust rods shall be installed at the couplings. The siphon breaker-air relief valve assemblies shall be installed as shown on the contract drawings.

#### 3.4.2 Pervious and Impervious Backfill

##### 3.4.2.1 Pervious Backfill

The pervious backfill layer as shown on the drawings shall be placed in 6-inch layers and shall be compacted to an average relative density of 85 percent with a minimum of 80 percent as determined by the relative density test for cohesionless soils (Test Method-ASTM D 4253 & D 4254). The field density determination shall be by the Sand-Cone Method, ASTM D 1556. Compaction shall be accomplished with the material in a saturated condition.

##### 3.4.2.2 Trench Under Crown of Levee

That portion of the trench under the crown of the levee shall be excavated at least 2 feet below the bottom of discharge pipe and replaced in 6-inch layers with suitable impervious material and compacted to 95% density as determined by standard compaction test.

##### 3.4.2.3 Impervious Backfill

Impervious backfill material placed within 2-feet of the pipe shall be placed in 6-inch layers. The material shall be carefully placed under the pipe and to at least 2-feet over the pipe. Each 6-inch layer shall be hand tamped to a compacted density of 95% proctor.

-- End of Section --

DIVISION 15 - MECHANICAL

SECTION 15200

WATER WELL SYSTEM

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DIVISION 15 – MECHANICAL

SECTION 15200

WATER WELL SYSTEM

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, equipment, labor and materials and performing all operations necessary for the installation of a new potable water well system with submersible pump, pressure tank, chlorinator and well controls at Drinkwater Pumping Station, all as specified herein and/or indicated on the drawings.

1.2 QUALITY CONTROL

The Contractor shall maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Well.

Casing depth, well depth, seal grouting, casing size and sterilization.

(2) Pumps and Motors.

Manufacturer's rated capacities, size, wiring connections, depth in well, installation, and plumbing connections.

(3) Samples.

Taken and submitted according to instructions of State Department of Natural Resources.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS.

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53-93a            Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM B 88-93a            Seamless Copper Water Tube

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA A100-90	Water Wells
AWWA C206-91	Field Welding of Steel Water Pipe

#### FEDERAL SPECIFICATION (FS)

GG-G-76E	Gages, Pressure and Vacuum, Dial Indicating (For Air, Steam, Oil, and Amd 1 Water, Ammonia, Chloro-Fluoro Hydrocarbon Gases, and Compressed Gases)
TT-E-489H	Enamel, Alkyd, Gloss Low VOC content
WW-H-171E and Amd 1	Hangers and Supports, Pipe

#### MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTING INDUSTRY (MSS)

SP 80-79	Bronze Gate, Globe, Angle, and Check Valves
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#### STEEL STRUCTURES PAINTING COUNCIL SPECIFICATIONS (SSPC)

SSPC-Paint 25	Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer
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### 1.4 GENERAL REQUIREMENTS

#### 1.4.1 Workmanship

All workmanship shall be first class in all respects, performed by mechanics especially skilled for this kind of work, and under the supervision and direction of an experienced well driller, and using modern, high quality equipment.

#### 1.4.2 Well Location

The well shall be drilled in the approximate location as shown on the drawings with the final location determined by the Contracting Officer.

### 1.5 SUBMITTALS

#### (1) General

The Contractor shall submit to the Contraction Officer, for approval prior to the construction of the well system, three copies of the manufacturer's certificates of compliance and/or specifications concerning the machinery, equipment, and materials to be incorporated in the work. The information furnished shall be of such quality that the machinery, equipment, and materials may be properly evaluated.

#### (2) Records

The Contractor shall supply the State of Missouri Department of Natural Resources with an accurate record of the drill hole diameter, assembled order of size, length and weight of casing, grouting depth, water level, and pumping test data.

#### (3) Submission of Cutting Samples

The Contractor shall save samples of the cuttings and shall submit them to the State of Missouri Division of

Geological and Land Survey, Jefferson, Missouri. The Contractor shall request instructions regarding the submission of drill cuttings at least one week prior to beginning construction. The request shall be made to the State of Missouri Division of Geological and Land Survey, Jefferson, Missouri. The Contractor shall request instructions regarding the submission of drill cuttings at least one week prior to beginning construction. The request shall be made to the State of Missouri Division of Geological Land Survey, who will supply a letter of instructions regarding the collection and handling of drill cuttings.

## PART 2 PRODUCTS

### 2.1 GENERAL

The well shall be the drilled type with a nominal hole size of not less than 8 inches and nominal casing size of not less than 4 inches and complete with a multistage submersible-type pumping unit. Upon completion, the well shall deliver not less than 15 gallons per minute to a 158 gallon capacity pressure tank which shall maintain an indicated gage pressure between 30 psi and 50 psi. The Contractor shall at all times protect the well in a manner which will effectively prevent either the tampering of or the entrance of foreign matter into it. Installation of the well shall conform to the requirements of AWWA A-100.

### 2.2 DRILLED WELL CONSTRUCTION REQUIREMENTS

#### 2.2.1 General

Drilled wells are considered to be those which are constructed in consolidated or unconsolidated geological formations by a rotary drill rig, hydraulic jet, or cable tool rig. In general, drilled wells will penetrate one or more water bearing formations with construction and development practices requiring the placement of a water-tight casing seal to separate the various water bearing strata penetrated, as well as to prevent contamination by surface waters. The well shall not be located within 100 feet of any sewer line or other similar and/or related objects.

### 2.3 CASING

#### 2.3.1 Size

The entire depth of the well above the screen shall be cased. The drilled hole shall have an 8-inch nominal diameter. The casing shall have a 4-inch nominal diameter. The casing shall be standard weight galvanized steel pipe, conforming to ASTM A53. Joints shall be either threaded and coupled, or field welded in accordance with AWWA C206.

#### 2.3.2 Guides

The casing shall be grouted into the drilled hole and shall be centered, using guides welded to the casing. Spacer guides shall be provided at the top, bottom, and along the entire length of the casing spaced not more than 100 feet apart. The spacer guides shall be installed parallel to the casing and in such a manner that they will in no way interfere with the cement grouting of the casing.

#### 2.3.3 Casing Sealing

A sufficient quantity of grout shall be used completely filling the annular space of the well. No drilling or other work in the well will be permitted within 48 hours after grouting is applied to the casing. The well casing shall be sealed by the addition of neat cement grout introduced under pressure from the bottom of the space to be grouted toward the ground surface. The grouting of the casing shall be performed in one continuous operation. Either of two methods of placing the cement grout may be used. These methods are as follows:

(1) The annular space between casing and the well hole shall be filled with Portland cement grout using the Halliburton method. With this method the grout is applied through the casing pipe, being preceded and succeeded by a "spacer" or "piston" plug. The plug is inserted and the casing capped; a measured amount of grout is applied; the second plug is inserted and the casing capped; a measured volume of water is pumped into casing until the second plug reaches the end thereof. The first plug drops into the drill hole below the casing which is suspended sufficiently to provide clearance, while the grout moves up into the annular space.

(2) This method employs a grout conductor pipe connected at the bottom of the casing by means of a valve fitting. In this method it is not necessary to predetermine the amount of grout needed to seal the casing. Sealing of artesian flows around the casing must be by this method. When drilling of the well is completed and before the casing is sealed, the static water level in the drill hole shall be accurately determined before the bridge is set and again after the plug is drilled out. Both static level elevations shall be recorded in the drill record book. Both methods of sealing the casing require that pressure be maintained on the grout for a minimum of 72 hours before the plug and bridge are drilled out or before drilling of the well continues. When the well penetrates caving formations, and pressure grouting is not feasible, the upper casing must be encased in neat cement or concrete to a depth of at least 10 feet or to the point of caving, if deeper. The neat cement or concrete filling the annular opening between the well casing and the drill hole must be vibrated, puddled, or otherwise treated to assure consolidation and the absence of voids.

#### 2.3.4 Screen

The screen openings shall be determined by the Contractor and appropriate manufacturer's literature on the basis of sieve analyses of the water-bearing strata. The screen shall be fabricated of stainless steel, bronze, or other corrosion-resistant material.

#### 2.3.5 Capping

After the well is completed and prior to installation of the pumping equipment, a threaded metal cap shall be firmly attached to the top of the casing to prevent the inclusion of any foreign material. After installation of the pump, the well shall be permanently capped as shown on the drawings and/or as specified herein.

#### 2.3.6 Breather Pipe

A breather pipe, protected by suitable screen, shall be provided on the submersible pump installation.

#### 2.3.7 Service Water Pipe

All underground piping between well and building shall be 1-1/4" copper tubing, Type K, conforming to ASTM B 88. All pipe above the slab shall be Schedule 40, galvanized steel pipe conforming to the requirements of ASTM A 53. Fittings for copper pipe shall be solder type and fittings for steel pipe shall be galvanized threaded.

#### 2.3.8 Pipe Hangers

Pipe hangers shall be furnished and placed where required or as directed, and the Contractor shall be responsible for their proper and permanent location. Pipe hangers shall conform to the requirements of Fed. Spec. WW-H-171.

### 2.4 PUMP

The Contractor shall furnish and install a new submersible pump complete with discharge check valve, drop pipe and pitless discharge unit, at the general location as specified in Paragraph 7 above. The pump shall have a capacity sufficient to deliver a minimum of 15 gallons per minute while pumping into the pressure tank with a tank pressure of 50 psig. The pump bearings shall be stainless steel. The pump motor shall come complete with submersible cable suitable for continuous immersion in water. The pump shall operate on 240 volts, 60 Hz, single-phase power, and the motor shall be of sufficient size to operate the pump under the maximum operating conditions without exceeding its rating. Pump shall be equipped with all necessary controls to provide for automatic operation of the pump. The pump and motor unit shall be no larger than 3-3/4 inches in diameter at any point.

#### 2.4.1 Depth

The approximate depth of the well shall be 900 feet. This depth is for estimating purposes only. The top of the casing shall be 24 inches above natural ground.

#### 2.5 PRESSURE TANK

The pressure water tank shall be a hydro-pneumatic diaphragm type and shall have a capacity of 158 gallons. The tank shall be fabricated of galvanized steel and shall have a minimum working pressure of 75 psig. Piping on tank shall be equipped with a pressure gauge, pressure switch, 3/4" drain valve, and 75 psig relief valve. The tank shall be a Model No. WX-600-L as manufactured by Amtrol Inc., 1400 Division Rd., West Warwick, RI., or an approved equal.

#### 2.6 VALVES.

##### 2.6.1 Relief Valve

The relief valve for the water tank shall be a 3/4", iron body, bronze trim, relief valve suitable for water service with a relief setting of 75 psig.

##### 2.6.2 Gate Valve

A gate valve shall be installed on the discharge line of the water storage tank. Gate valve shall be bronze, 125-pound, wedge disc, rising stem, inside screw, conforming to MSS SP 80.

##### 2.6.3 Hose Bibb

The hose bibb shall be wheel operated, bronze or brass construction, with 3/4" NPT inlet and 3/4" hose connection.

#### 2.7 PRESSURE GAUGE

The pressure gauge shall meet the applicable requirements of Fed. Spec. GG-G-76 for Class 1 pressure gage, Style X - Single, Size 3 1/2" diameter, Type I, Water. The gage shall have either brass or phenolic case and shall be suitable for mounting in threaded fittings. The scale range shall be 1-100 psig.

#### 2.8 HYPOCHLORINATION SYSTEM

The chlorinator shall consist of a pump, float switch, solution crock, tubing, ejector, and controls, and shall be installed as indicated on drawings. The solution pump shall be the positive-displacement type designed for feeding sodium or calcium hypochlorite or similar solutions. The pump shall be furnished complete with an electric motor suitable for use on a 120 volt, single phase, 60-Hz circuit. A chemical resistant plastic hose shall connect the pump to the injector which is to be installed on the inlet pipe to the storage tank. The pump shall be capable of pumping sufficient solution to produce, at the well pump design flow, a chlorine residual of not less than one part per million when pumping against pressures up to 100 psig, and the pumping rate shall be adjustable. The solution pump shall operate whenever the well pump is running. The solution tank shall have a 50 gallon nominal capacity and shall be made of a translucent plastic material such as polyethylene. The system shall be fully tested in accordance with the manufacturer's recommendations, following instructions. The Contractor shall provide, with the system, a chlorine test kit for testing the residual chlorine in the plumbing system, and twenty pounds of calcium or sodium hypochlorite in five pound containers. The chlorine test apparatus shall have a range of 0.0 to 4.0 and shall be calibrated in 0.5 parts per million or smaller increments.

## 2.9 DISINFECTANT

The pressure tank and new water supply lines shall be disinfected with a 50 ppm chlorine residual for 24 hours and flushed.

## PART 3 EXECUTION

### 3.1 INSTALLATION

The Contractor may install the casing in increments or he may drill the well to the total depth before installing the casing. The well shall be checked for alignment and plumbness. The well shall not vary from vertical more than 4 inches in 100 feet. The well shall be checked for straightness by use of a section of pipe having an outside diameter of not less than 3 1/2 inches and a length of at least 40 feet. The check pipe shall be inserted into the casing and the well checked for the full depth. In the event the well does not pass the test for straightness, the Contractor shall take such action as deemed necessary to correct the deficiency.

### 3.2 ABANDONMENT OF WELLS

In the event the Contractor fails to construct a well of the required capacity, or should the well be abandoned because of loss of tools or for any other cause, the Contractor shall fill the abandoned hole with sand-cement grout and remove the casing.

### 3.3 PRELIMINARY CAPACITY TEST

After the well has been thoroughly developed, equipment shall be installed and operated for determining the hydraulic conditions and capacity. Duration of the test shall be not less than two hours.

### 3.4 OFFICIAL PUMP CAPACITY TEST

When installation of the permanent pumping equipment is completed, the Contractor shall test the permanent equipment to prove its firm capacity. The duration of the test at the well shall not be less than 4 hours at a pumping rate as specified for the well in 10 above. All electrical power will be furnished by the Government.

### 3.5 STERILIZATION

The well shall be disinfected after installation of the pump. A sufficient quantity of chlorine bearing compound shall be placed in the bottom of the well in such a manner that will bring the chlorine concentration to 50 ppm in the well water. The well shall be purged several times by operating the pumping equipment. A minimum contact period of 24 hours shall be observed in order to permit effective disinfection and the well shall then be pumped until the odor of chlorine disappears from the delivery water. If, after 24 hours, there is an odor of chlorine in the water, the pump shall be operated until the chlorine once again disappears. Any type of prepared chlorine compound may be used.

### 3.6 SAMPLING AND TESTING

In cooperation with, and when directed by the Contracting Officer, the Contractor shall collect and analyze samples of water from any specified stratum. Samples shall be collected by means other than air pumping; in such a manner

as to insure that they come from the specified stratum and are not diluted or contaminated by waters from other strata. Samples shall be collected in suitable containers. Methods of collecting and caring for test samples shall be approved by the Contracting Officer prior to sampling and testing. Tests for iron content, carbon dioxide, hydrogen sulfide, dissolved oxygen and pH value shall be made at the well site, without undue delay between sampling and testing, and two copies of the test results furnished to the Contracting Officer. Two one gallon water samples from the well in containers furnished to the Contractor shall be submitted to the State of Missouri Department of National Resources for testing. Expenses incident to these analyses shall be borne by the Contractor and the results of the analysis shall be furnished the Contracting Officer. All sampling and analysis shall be performed using EPA and State approved methods, procedures and holding times. Water Quality Analyses shall address each item specified in the following table:

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WATER QUALITY ANALYSIS TABLE

Characteristics

Physical

Color	Resistivity in ohms per cubic centimeter at 25 degrees C.
Threshold odor number	Taste
Turbidity	pH value
Temperature	

Chemical (Expressed as mg/l)

Arsenic	Bicarbonates as HCO(3)
Barium	Carbonates as CO(3)
Cadmium	Nitrates as NO(3)
Chromium	Silica as SiO(2)
Copper	Toxaphene
Lead	2-4-D
Mercury	2, 4, 5 TP Silvex
Selenium	Total Organic Halogens
Silver	TOC
Zinc	Total Hardness as CaCO(3)
Fluoride as F	Endrin
Manganese as Mn (dissolved and total)	Lindane
Iron as Fe (dissolved and total)	Methoxychlor
Suspended Solids	Chlorides as Cl
Total Dissolved Solids	Sulphates as SO(4)
Alkalinity (methyl-orange)	Magnesium as Mg
(Pnenolphthalein) as CaCO(3)	Calcium as Ca
	Sodium and Potassium as Na

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Two certified copies of the water analysis report for each sample analyzed shall be furnished to the Contracting Officer promptly upon completion of the analysis. Drilling of the hole shall be discontinued while test samples are being collected. From a study of the water analysis reports, the Contracting Officer will determine which of the water-bearing strata is to be developed. If the test results indicated that a well cannot be developed at the tested depth, the Contractor will be required to continue drilling the hole as directed by the Contracting Officer. The bacteriological and chemical parameter shall conform to the requirements of the Missouri Department of Natural Resources. After the sterilization, the Contractor shall collect and deliver bacteriological samples of the well to the Missouri Department of Health. Bacteriological sampling shall be continued for two consecutive days and the sampling shall be sent to the Missouri Department of Health until the samples are safe.

### 3.7 DISPOSITION OF WATER AND EXCAVATION

During the drilling, development, and testing of the well, all water and resulting excavation shall be disposed of in

such manner that no damage will result to immediate and/or adjacent sites; all in a manner satisfactory to the Contracting Officer.

### 3.8 REPORT

At the conclusion of work on the well, the Contractor shall prepare in duplicate and deliver to the Contracting Officer and the Missouri Department of Health, a report consisting of a summary describing all work performed, results obtained, drilling log, pump installation report, results of tests and analysis, and any other pertinent information.

### 3.9 ACCEPTANCE

The well system will be accepted as a unit when all work on the well system has been completed and all reports, including the chemical analysis and bacteriological examination, have been submitted to and approved by the Missouri Department of Natural Resources.

### 3.10 WATER WELL GUARD BOLLARDS

Upon completion of the water well, the Contractor shall furnish and install four concrete filled steel pipe guard bollards, anchored in concrete, around the well as indicated on the drawings. Steel pipe shall be black steel pipe conforming to the requirements of ASTM A 53, Schedule 40. Concrete shall conform to the requirements of paragraph 3.11 below. After installation, the above-ground portions of the pipe guard bollards shall be given one coat of paint conforming to the requirements of SSPC-Paint 25, followed by two coats of yellow paint conforming to the requirements of Fed. Spec. TT-E-489, specific color to be selected by the Contracting Officer.

### 3.11 CONCRETE

Concrete shall consist of one part Portland cement; two parts clean, washed sand; three parts of 1-inch maximum size, clean, well-graded, hard-surfaced coarse aggregate; a suitable air-entraining admixture; and sufficient water to produce a slump between one and four inches. Entrained air shall be six percent, plus or minus 1-1/2 percent. The concrete shall be mixed in a manner so as to produce a mixture having a consistency which will permit placement as indicated on the drawings. Concrete mixed at the job site shall be used in the work within 45 minutes after mixing. Concrete mixed at a commercial mixing plant and transported to the job site in trucks shall be used in the work within 1-1/2 hours after mixing. Retempering of concrete will not be allowed. Concrete shall not be placed when the ambient temperature is below 40 degrees F or above 85 degrees F unless otherwise approved by the Contracting Officer in writing; nor when the concrete, without special protection, is likely to be subjected to freezing temperatures before final set has occurred. Prior to placing concrete, all surfaces upon which the concrete is to be placed against, shall be wetted. Concrete shall be thoroughly consolidated after placement by suitable vibrators or by rodding. Concrete shall be given a trowel finish and shall be cured by keeping the surface continuously wet for a period of not less than 72 hours or by application of an approved curing compound.

-- End of Section --

DIVISION 15 - MECHANICAL

SECTION 15400

PLUMBING SYSTEM

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DIVISION 15 – MECHANICAL

SECTION 15400

PLUMBING SYSTEM

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all labor, plant, materials, and equipment and performance of all operations in connection with installing the plumbing system as shown on the drawings and as specified herein. The plumbing system will include the water supply system, starting at the shutoff valve on the water pressure tank, and the waste and vent system, including all fixtures, the sewage treatment plant, and effluent line.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including, but not limited to the following:

- (1) Inspection on delivery of all supplies and materials.
- (2) Inspection at the work site to assure use of specified material and equipment.
- (3) Installation, testing, adjusting, and sterilization of plumbing system and all equipment.

Three copies of these records and tests, as well as the records of corrective action taken, shall be furnished to the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI).

1010-84            Drinking Fountains and Self- Contained, Mechanically-Refrigerated Drinking Water Fountains

AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS (ASHREA)

90A-80            Household Electric Storage Tank Water Heaters

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B 88-89            Seamless Copper Water

C 795-91           Thermal Insulation for use in contact with austenitic stainless steel

C 916-85           Adhesives for Duct Thermal Insulation

D 2665-91	PVC Plastic Drain, Waste, and Vent piping and Fittings
D 3278	Vapor Barrier Coating
E 84	Glass Tape

AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS (ASHRAE)

90A-80	Energy Conservation in New Building Design FEDERAL SPECIFICATIONS (FED. SPEC.)
BB-C-120C	Chlorine, Technical, Liquid
O-C-114B & Am-2	Calcium Hypochlorite Technical
O-F-506C	Flux, Soldering, Paste and Liquid
O-S-602E	Sodium Hypochlorite Solution
WW-H-171E	Hangers and Supports, Pipe
WW-U-516B	Unions, Brass or Bronze, Threaded Pipe Connections and Solder-Joint Tube Connections

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

B16.18-78	Cast Copper Alloy Solder-Joint Pressure Fittings Pressure Fittings
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NATIONAL ASSOCIATION OF PLUMBING, HEATING, COOLING CONTRACTORS (NAPHCC)

NAPHCC-O1-90	National Standard Plumbing Code & Supple 91
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NATIONAL FIRE PROTECTION ASSOCIATION CODES STANDARDS (NFPA)

NFPA 10-90	Standard for Portable Fire Extinguishers
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MANUFACTURERS STANDARDIZATION SOCIETY OF VALVES AND FITTINGS  
INDUSTRIES (MSS)

SP-80-87	Bronze, Gate, Globe, Angle and Check Valves
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PLUMBING AND DRAINAGE INSTITUTE (PDI).

WH201-77	Water Hammer Arrestors
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UNDERWRITER'S LABORATORY (UL)

UL 174-97	Energy Conservation in New Building Construction
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1.4 GENERAL REQUIREMENTS

The general arrangement of the plumbing shall be as indicated on the contract drawings. Proposed departures due to

actual field conditions or other causes shall be submitted to the Contracting Officer for approval. The Contractor shall carefully examine the drawings and shall be responsible for the proper fitting of materials and equipment in the building, as indicated, without substantial alteration. All plumbing shall be installed to meet as a minimum the applicable requirements of the National Plumbing Code. The supply line to each item of equipment or fixture, except flush valves, or other control valves which are supplied with an integral stop, shall be equipped with a cutoff stop valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to all fixtures and flush valves shall be anchored to prevent movement.

#### 1.5 MATERIAL AND TEST

Required materials not covered by the detailed specifications shall be the best commercial quality and shall be of the required class, grade and type. Shop tests of piping, valves, fittings, fixtures and accessories required by Federal Specifications to be conducted in the presence of a Government Inspector, are waived.

#### 1.6 CONTRACTOR'S INVESTIGATION AND LAYOUT

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly, furnishing such fittings, traps, valves and accessories as may be required to meet such conditions, at no additional cost to the Government. The work shall be carefully laid out in advance, and no excessive cutting of construction will be permitted. Damage to the building piping, wiring, or equipment as a result of cutting for installation shall be repaired by mechanics skilled in the trade involved, at no additional expense to the Government.

#### 1.7 CLEANLINESS

Pipe openings shall be closed with caps or plugs during pipe installation. Fixtures and equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury. Upon completion of all work, the fixtures, materials and equipment shall be thoroughly cleaned, adjusted and operated.

#### 1.8 WORKMANSHIP

Material, fixtures, and equipment shall be installed in accordance with the approved recommendation of the manufacturer to conform with the contract documents.

#### 1.9 SUBMITTALS

As soon as practicable and before any fixtures and equipment are purchased, the Contractor shall submit, for approval by the Contracting Officer, five copies of a complete schedule of fixtures and equipment to be incorporated in the work, together with the name and addresses of the manufacturers and complete catalog information on each item. If conformance to a Federal, ASTM or other reference specification is expressly stated in the printed catalog information submitted, the Contractor shall include a notarized statement, signed by an officer of the company manufacturing the article in question, stating that the product does meet the requirements of such specification. No consideration will be given to partial lists submitted from time to time. Approval of the equipment will be based on manufacturer's published ratings. Approval of fixtures and equipment under this provision shall not be construed as authorizing any deviations from the specifications unless the attention of the Contracting Officer has been directed to the specific deviation. Equipment differing from that specified may be proposed, provided the Contractor clearly states such differences and provided all essential requirements of the specifications are met. If the equipment offered under this provision is, in the opinion of the Contracting Officer, equal to or better than that specified, it will be given consideration.

## PART 2 PRODUCTS

### 2.1 SANITARY DRAIN, WASTE AND VENT PIPE AND FITTINGS

All sanitary waste, drain and vent pipe and fittings inside the building shall be PVC conforming to the requirements of ASTM D 2665. Fittings shall be solvent weld.

### 2.2 FLASHING

Pipe passing through roof shall be flashed using lead or copper flashing with a flange of adequate size to extend not less than 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal. Pipes shall be installed through a 4-pound flashing or a 16-ounce copper flashing. Flashing shall be suitably formed, and the skirt or flange shall set over the roof in a solid coating of bituminous cement. Flashing for dry vents shall be turned down into the pipe a minimum of 2" to form a waterproof joint.

### 2.3 WATER LINES

Water lines from the gate valve on the water pressure tank shall be copper tubing meeting the applicable requirements of ASTM B 88. Copper tubing shall be Type L, hard drawn. Solder joint fittings shall be copper or bronze streamline type expressly manufactured for connecting copper tubing. Solder joints shall meet the applicable requirements of ANSI B16.18. Flux shall meet the applicable requirements of Fed. Spec. O-F-506.

### 2.4 WATER HAMMER ARRESTORS

Water hammer arrestors shall be provided on the supply lines where shown on drawings. The arrestors shall have a resting type bellows contained within the casing. Both casing and bellows shall be constructed of stainless steel. Arrestors shall be sized, tested, and certified in accordance with the Plumbing and Drainage Institute Standard PDI-WH201.

### 2.5 UNIONS

Unions on copper tubing shall be suitable type conforming to Fed. Spec. WW-U-516. Unions shall not be concealed in walls, ceilings, or partitions. The unions shall have metal connections on both ends. The ends shall be threaded or soldered to match adjacent piping. The metal parts of the unions shall be separated to prevent current flow between dissimilar metals.

### 2.6 INSULATION

All hot water lines, and all cold water lines throughout shall be insulated with 1-inch thick molded fiber-glass provided with a factory applied noncombustible vapor-barrier jacket consisting of a lamination of aluminum foil, glass fiber reinforcing, and a light-color kraft paper on exterior side. The longitudinal lap of the vapor-barrier jacket shall be not less than 1-1/2 inches. Strips of vapor-barrier jacket material not less than 3 inches shall be provided for use at the circumferential joints of the insulation. Insulation shall be secured with self-sealing laps of adhesive conforming to ASTM C 916, Type 1. Insulation shall be stapled at seams on 4-inch centers using 1/2-inch stainless steel or monel outward clenching staples. Insulation through hangers shall be continuous and protected with 18 gauge galvanized steel shields. Fittings and valves shall also be insulated as required for pipe. Insulation shall be factory premolded, prefabricated or field-fabricated segments of the same material and thickness as the adjoining pipe insulation. Polyvinylchloride fitting covers may also be used. Insulation shall be applied to fittings and valves using glass tape applied between two layers of vapor-barrier coating. Vapor-barrier coating shall conform to ASTM D 3278 and glass tape shall conform to ASTM E 84.

## 2.7 VALVES

Valves shall be provided on supplies to equipment or fixtures if not specified. Valves in connection with runouts, risers, branches, and mains shall be in accordance with these specifications and installed where indicated. Valves shall be all bronze, 125 pound, wedge disc, rising stem, gate valves conforming to (MSS) Std. Spec. 80.

## 2.8 PIPE SLEEVES

Pipes passing through concrete floors or masonry walls shall be provided with pipe sleeves, fitted into place at time of construction. The space between the pipe and sleeve shall be filled with a quality grade polyurethane foam.

## 2.9 FIXTURE SUPPORTS

The lavatory shall be furnished with a floor mounted chair carrier with concealed arms.

## 2.10 ESCUTCHEONS

Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated passes through floors, walls, or ceilings, except in chaseways. Escutcheons shall be fastened securely to pipe or pipe covering and shall be chromium-plated iron or chromium-plated brass, either one-piece or split pattern held in place by internal spring tension or setscrew.

## 2.11 PIPE HANGERS AND SUPPORTS

The Contractor shall furnish and set pipe hangers and supports and shall be responsible for their proper and permanent location. Hangers and supports shall conform to Fed. Spec. WW-H-171. For piping up to and including 1-1/4 inch, 18-gage minimum steel strap-type or thermoplastic hangers may be used and shall be secured by screw fasteners. Clip hangers type 26 may be used on piping sizes 3/4 inch to 4 inch and offset hangers type 27 may be used on piping sizes 1/2 inch to 3 inch. Metallic hangers in contact with copper tubing shall be electrolytically coated and shall be sized to suit the outside diameter of the pipe.

## 2.12 WATER CLOSET

Water closet shall be vitreous china, floor mounted with flush tank. Water closet to be "water economy", siphon jet, rim fed, whirlpool action, elongated rim bowl with self draining jet. Gasket shall be wax type. Seat shall be white, heavy-duty, commercial, high-impact polystyrene for elongated bowl, with cover. Supply shall include chrome plated angle stop with wheel handle, chrome plate riser tube, and escutcheon.

## 2.13 LAVATORY

Lavatory shall be vitreous china with back, rectangular basin, splash lip, front overflow, 20" wide by 18" deep, and drilled for carrier with concealed arms. Faucet shall be single control, mixing type. Faucet shall be washerless with replaceable cartridge control unit. Valves shall be copper alloy. Handles shall be acrylic. Lavatory shall have pop-up drain with stopper, lift rod, jam nut, washer, and tailpiece. Trap shall be chromium plated brass. Supply shall include chrome plated angle stop with wheel handle, chrome plated riser tube, and escutcheon.

## 2.14 DOUBLE SINK

Sink for kitchen counter top shall be double bowl, 22 gauge high nickel content stainless steel with satin buffed finish. Sink shall measure 33" long by 22" wide with 6 1/2" deep compartments. Faucet shall be lever operated, single control,

mixing type. Faucet shall be washerless with replaceable cartridge control unit. Valve and handle shall be copper alloy. Faucet to have aerator and hose and spray attachment. Tail pieces and trap shall be chrome plated brass. Supplies shall include chrome plated angle stops with wheel handles, chrome plated riser tubes, and escutcheon plates.

## 2.15 WATER HEATER

Water heater shall be 30 gallon, electric with glass lined tank. The thermal efficiency and standby heat loss shall meet or exceed the requirements of ASHRAE 90A. Heaters shall be complete with control system, drain valve, and ASME rated combination pressure and temperature relief valve. Water heater shall conform to UL 174, with dual heating elements. Each element shall be 4.5 kW. The elements shall be wired so that only one element can operate at a time. Heater shall be 240 volt, 60 Hz, single phase. Connections to water heater shall be made with dielectric unions.

## 2.16 SEWAGE TREATMENT PLANT

The sewage treatment plant shall be a biological aerobic system . The sewage treatment plant shall consist of two treatment tanks and a chlorine contact chamber. The first treatment tank shall be an aeration tank where sewage mixes with aerated liquid. A compressor mounted on the treatment plant will furnish air to the aeration tank. Air diffusers shall be stainless steel, non-clog type. The second tank shall be a biological filter tank where sludge in the liquid settles out in the bottom of the tank and the remaining liquid passes through a biological filter to the top. After passing through the biological filter, the liquid shall pass into a chlorine contact chamber where disease-carrying bacteria are killed. From here the effluent will be discharged into the pumping station sump. A 5 gallon chlorine solution holding tank with wall mounting bracket shall be furnished with the sewage treatment plant. The sewage treatment plant shall be certified by the U.S. Coast Guard as a Type II Marine Sanitation Device. The sewage treatment plant shall be a Model RF-50-A-FP Fox Pac Sewage Treatment Unit with gravity discharge as manufactured by Redfox Environmental Services, Inc., Lafayette, La. or approved equal.

## 2.17 SEWAGE TRANSFER PUMP

The Contractor shall furnish and install as shown on the contract drawings, one horizontal 3/4 HP, 2" inlet by 2" discharge semi-open impeller type, non-clog centrifugal pump suitable for pumping sewage sludge. The pump shall deliver a capacity of 40 GPM when operating against a total dynamic head of 20 feet. The pump shall be suitable for operation on single phase, 60 Hz, 230-Volt power supply.

## 2.18 PIPE CLEANOUTS

Cleanouts shall be the same size as the pipe except that cleanout plugs larger than four inches will not be required. Each cleanout shall consist of a PVC female adapter with PVC pipe plug.

## 2.19 FIRE EXTINGUISHERS

Five 20-pound all-purpose (2A:20B:C) portable fire extinguishers shall be provided for this project. The extinguishers shall be installed and located as shown on the contract drawings, 3 on operating floor and 2 in the equipment room. The all purpose fire extinguishers shall be capable of extinguishing Class A, B and C type fires and shall be of the dry chemical type. The extinguishers shall be hand held, trigger or grip operated with fighting capability plainly indicated on the label and shall meet all the requirements of NFPA 10.

## PART 3 EXECUTION

### 3.1 TYPES OF FIXTURES AND FIXTURE TRIMMINGS

Fixtures specified herein shall be furnished and installed with all trimmings and fittings, unless otherwise specified under this item.

### 3.2 FIXTURE CONNECTIONS

Connections between earthenware fixtures and flanges on soil pipe shall be made absolutely gastight and watertight with a closet-setting compound or with a neoprene gasket and seal. Use of natural-rubber gaskets or putty will not be permitted for these connections. Fixtures with outlet flanges shall be set the proper distance from the floor or wall to make a first-class joint with the closet-setting compound and fixture used.

### 3.3 HEIGHT OF FIXTURE RIMS ABOVE FLOOR

Lavatories shall be mounted with rims 31" from finished floor. Water closets shall be floor mounted with rims 15" from finished floor.

### 3.4 PAINTING

All exposed pipe hangers, supports, and other ferrous materials that are not factory coated shall be cleaned, primed with red iron oxide and coated with two coats of alkyd semi-gloss enamel in accordance with SECTION 09900 – PAINTING – GENERAL.

### 3.5 PIPING INSTALLATION

All interior piping shall be installed to permit drainage. All lines shall be cut accurately to measurements established at the worksite and shall be worked into place without springing or forcing. Horizontal supply lines shall pitch upward in the direction of flow. All open ends of lines shall be capped or pinched during construction to keep dirt and foreign material out of the system. Joints shall be made essentially as follows: Tubing shall be cut square. The ends shall be reamed to remove the inside burr and then sized if necessary. Inside and outside surfaces of the tubing ends shall be polished with steel wool and covered with a thin coat of a reliable brand of soldering flux. The tubing ends shall be completely filled with soft solder. When the solder has cooled to a plastic state, all excess solder and flux shall be removed. In making subsequent connections to the same fitting, care shall be taken to avoid melting the solder at existing connections. Connections between copper tubing and steel pipe or other steel components shall be made with insulating unions to avoid the danger of galvanic corrosion.

### 3.6 INSULATION APPLICATION

Insulation shall be applied to the pipe with all joints tightly butted. For barrier jackets, longitudinal laps shall overlap not less than 1-1/2 inches. Butt-joints shall be wrapped with a 3-inch wide strip of the same material as the jacket. Butt strips and jacket laps shall be cemented with adhesive conforming to ASTM C 916, Type 1, and additionally secured with staples on 4 inch centers. Staples and seams shall be sealed with a brush coat of vapor barrier coating conforming to ASTM D 3278. At the option of the Contractor, a factory self-sealing system may be used when the temperature at the time of application is between 40 degrees and 120 degrees F. When a factory self-sealing system is used, staples may be used to additionally secure jacket laps and butt strips. When staples are used, they shall be sealed with a brush coat of vapor barrier coating. If fishmouths occur, the Contractor shall either replace those portions of the insulation where the fishmouths occurred or cement the fishmouths closed with Class 2 adhesive. Fishmouths shall be additionally secured with staples. Staples and seams at fishmouths shall be sealed with a brush coat of vapor barrier coating. Fittings shall be insulated with factory premolded, prefabricated or field fabricated sections of insulation of the same material and thickness as the adjoining pipe insulation.

### 3.7 TESTS

The plumbing system shall be tested in accordance with NAPHCC-01.

### 3.8 CLEANING

Equipment, pipes, valves, fittings, and fixtures shall be cleaned of grease, metal cuttings, and sludge that may have accumulated from operation of the system during the test. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building, due to the Contractor's failure to properly lean the piping system, shall be repaired by the Contractor without cost to the Government. Flush valves and automatic control devices shall be adjusted for proper operation.

### 3.9 STERILIZATION

After pressure test have been made, the entire domestic water-distribution system shall be sterilized. Prior to introducing chlorinating material the entire system shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing chlorinating material. The chlorinating material shall be either liquid chlorine conforming to Fed. Spec. BB-C-120 or hypo chlorite conforming to Fed. Spec. O-C-114, or Fed. Spec. O-S-602, Grade A or B. The chlorinating material shall provide a dosage of not less than 50 parts per million and shall be introduced into the system in an approved manner. 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 10 p.p.m of chlorine at the extreme end of the system at the end of the retention period. All valves in the system being sterilized shall be opened and closed several times during the contact period. The system shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. During the flushing period all valves and faucets shall be opened and closed several times. From several points in the system, the Contracting Officer will take samples of water in properly sterilized containers for bacterial examination. The sterilizing shall be repeated until the tests indicate the absence of pollution for at least two full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

### 3.10 WARRANTY

The Contractor shall furnish, to the Contracting Officer, the manufacturer's standard warranty or guaranty for the equipment and materials installed under this section of the specifications. Upon receipt of notice from the Government of failure of any part of the guaranteed materials or equipment during the guaranty period, new replacement part or parts shall be furnished and installed promptly by the Contractor at no additional cost to the Government.

--End of Section--

DIVISION 15 - MECHANICAL

SECTION 15653

HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

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DIVISION 15 – MECHANICAL

SECTION 15653

HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all labor, plant, materials, and equipment and performance of all operations in connection with installing the heating, ventilating and air conditioning systems as shown on the drawings and as specified herein.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including, but not limited to the following:

- (1) Inspection on delivery of all supplies and materials.
- (2) Inspection at the work site to assure use of specified material and equipment.
- (3) Installation, testing, and adjusting of all equipment.

Three copies of these records and tests, as well as the records of corrective action taken, shall be furnished to the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 527-91 Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process, Lock-Forming Quality

ASSOCIATION OF HOME APPLIANCE MANUFACTURERS (AHAM)

AHAM-01 (Oct 1991) Directory of Certified Room Air Conditioners

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A (1989) Installation of Air Conditioning and Ventilating Systems

AIR MOVING AND CONDITIONING ASSOCIATION (AMCA)

STANDARD 210 Test Code for Air Moving Devices

FEDERAL SPECIFICATIONS (FED SPEC.)

CC-M-1807                      Motors, Alternating Current, Fractional and Integral Horsepower (500 Horsepower or smaller)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A                      (1989) Installation of Air Conditioning and Ventilating Systems

UNDERWRITERS LABORATORIES (UL)

UL 484                         (Mar 29, 1982; 6th Ed; Rev thru Mar 30, (1990) Room Air-Conditioners

1.4 SUBMITTALS

As soon as practicable and before any equipment is purchased, the Contractor shall submit, for approval by the Contracting Officer, five copies of complete catalog information on the items being furnished.

1.5 ELECTRICAL WORK

Electric motor-driven equipment specified shall be provided complete with motors and controls. Electrical equipment and wiring serving equipment shall be in accordance with Section 16415 ELECTRICAL WORK, INTERIOR.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products and shall have been in satisfactory use for at least 2 years prior to bid opening.

2.2 AIR CONDITIONERS, ROOM

2.2.1 Type

Unit shall be 18,000 BTU/hr heat pump model, factory fabricated, assembled, and precharged. Unit shall be ready for full capacity operation after terminal point connection. Unit shall conform to the requirements of UL 484 and produce a minimum EER of 8.5 when rated in accordance with AHAM-01. Unit shall provide year round heating and cooling functions. Function and temperature controls shall be integral to unit. The refrigerant used shall have Ozone Depletion Potential not greater than 0.05.

2.2.2 Wall Sleeve

Louver shall be storm proof type, constructed of anodized, stamped or extruded aluminum. Sleeve shall be a water and airtight assembly, with weather-resistant protective coating.

2.2.3 Room Cabinets

Cabinets shall be free of visible fasteners, sharp protuberances and edges. Enclosure sheet metal shall be a minimum

of 18-gauge steel with a protective coating. Face panels shall be removable and shall provide full access to unit appurtenances. Access to controls shall be without removal of the face panel. Conditioned air shall discharge through adjustable louvers. Cabinet shall be thermally and acoustically insulated with materials which conform to NFPA 90A.

#### 2.2.4 Compressor

Compressor shall be hermetically sealed reciprocating, rotary, or scroll type. Compressor shall be fitted with permanent split capacitor motor, overload protection, and vibration isolators. Compressor shall be protected against high discharge pressure, loss of charge, low voltage, and short cycling. Compressor shall be 230 volt, 60 Hz, single phase.

#### 2.2.5 Cooling Section

Cooling section shall include self-contained, precharged, slide-in or removable chassis-mounted, air-cooled refrigeration system. Unit shall be suitable for indicated capacity cooling operation with 95 degrees F outdoor air temperature.

#### 2.2.6 Condenser and Evaporator Coils

Coils shall be nonferrous tubes of 3/8-inch minimum diameter with copper or aluminum fins mechanically bonded or soldered to the tubes. A condensate removal system shall be provided.

#### 2.2.7 Fans

Room air fans shall be centrifugal type, dynamically balanced and directly driven. Condenser fans shall be manufacturer's standard type. Fan motors shall be inherently protected, permanent split-capacitor type.

#### 2.2.8 Filters

Filters shall be of the sectional or panel cleanable type, and shall filter the entire air supply.

#### 2.2.9 Electric Coil

Electric coils shall preclude external access and shall be equipped complete with safety and operating controls which include automatic temperature reset limit control and secondary fusible link protection. Coil shall be fitted with one stage heat control. Coil mounting shall preclude expansion and contraction noise.

#### 2.2.10 Condensate Removal System

The condensate produced during cooling mode shall be eliminated using slinger ring on outdoor fan. Heat pump condensate shall be disposed of by using a small pump to transfer water from the base pan to a collector tray where it can drip onto the warm indoor coil.

#### 2.2.11 Function Controls

Controls shall include an on-off switch, high and low cool and high and low heat selector switch, multiple speed fan cooling and heating mode, room air fan switch, outside air damper control, and an adjustable cooling and heating thermostat.

### 2.3 LOUVERS

#### 2.3.1 General

The intake and exhaust louvers shall be of the same type so that a uniform appearance is achieved. The intake and exhaust louvers shall have two sets of blades, one set fixed and one set movable, built into a common, integral, 6 inch

deep frame. Each louver shall be complete with; bird screen and operating mechanism as specified herein and/or as shown on drawings. The intake louvers shall be of the visible vertical mullion type, and if size dictates, may be furnished in more than one vertical section. The intake and exhaust louvers shall be fabricated of extruded aluminum, and shall have an aluminum frame with caulking slot and drain-off sill blade. The exterior blades shall be fixed and shall be slanted at not less than a 45 degree angle and be spaced at not greater than 4 5/16 inches on center. The louvers shall have mill finish.

### 2.3.2 Intake Louvers

The frame, exterior blades, and manually adjustable interior blades shall have a minimum thickness of 0.080 inches. The interior blades shall have a vinyl wiping seal and a moisture stop. The manually adjustable interior blades shall have an operating lever and thumb-screw lock, located approximately four feet above the floor for easy accessibility. The intake louvers shall be of the sizes as indicated on the contract drawings.

### 2.3.3 Exhaust Louvers

The frame and the fixed exterior blades shall have a minimum thickness of 0.080 inches. The automatic backdraft damper blades shall have a minimum thickness of 0.071 inches. The automatic backdraft damper blades shall have a vinyl wiping seal. The exhaust louvers shall be of the sizes as recommended by the engine manufacturer. The free air velocity through the exhaust louvers shall not be greater than 1500 feet per minute. The exhaust louver shall have a maximum pressure drop of less than 0.5 inches of water.

### 2.3.4 Duct Work

The ductwork including all necessary reinforcement, braces, and supports to be installed between the exhaust louver and the engines shall be of galvanized, 20-gage (0.0359 inches) sheet steel meeting the applicable requirements of ASTM 527. The duct shall be securely attached to the louver and provided with a sound vibration absorbing boot of glass fiber fabric or fire-proof canvas.

### 2.3.5 Bird Screen

Each louver shall have 1/2" X 1/2" mesh, 16 gage, aluminum bird screen mounted in standard removable "U" shaped aluminum frames and shall be attached to the exterior side of the louvers with stainless steel sheet metal screws.

## 2.4 POWER ROOF VENTILATOR

One power roof ventilator shall be furnished, installed and properly operated. The ventilator shall be installed at the location as indicated on the contract drawings and as recommended by the roof ventilator manufacturer. The unit shall be axial flow exhaust type, driven either directly or thru an adjustable v-belt by totally enclosed motor of not less than half horsepower. The motor shall be suitable for operation on a single phase, 60 Hz, 120-volt power supply and shall conform to the requirements of Fed Spec. CC-M-1807. The ventilator shall have a flow capacity of not less than 5200 CFM at 0" static pressure. The ventilator shall be certified to bear the AMCA seal for air performance. The housing shall have a hinged hood for ready access to a motor, bearings, propeller and v-belt drive, if used, for services and maintenance. The ventilator shall have a birdscreen of heavy duty galvanized wire to prevent entrance of foreign matter. Automatic gravity type shutters shall be furnished and installed. Shutters shall have interconnected aluminum blades with felt edges, extruded aluminum frames, and stainless steel sleeve bearings.

## 2.5 EXHAUST VENTILATOR

Exhaust ventilator for bathroom shall be for thru-the-wall mounting. Ventilator shall have 8 inch fan and be rated for a minimum of 180 cubic feet per minute. Ventilator shall come complete with automatic backdraft damper with outside weather hood, insect screen, adjustable housing, and interior matte white polymeric grille with face seal. Exhaust ventilator shall be mounted 6 feet above the floor. Ventilator shall be UL listed and HVI certified.

## 2.6 ELECTRIC UNIT HEATER

Electric unit heater shall be designed for heavy-duty, continuous use in an industrial application. Heater shall be rated for an output of 5 kW with a minimum of 400 CFM at outlet. Unit shall be ceiling mounted in position as shown on drawings. Elements shall be corrosion resistant, totally enclosed, finned sheathed type, with high temperature cutout. Housing shall be heavy gauge steel with adjustable outlet louver diffuser. Thermostat shall be built into unit. Heater shall be rated for 240 volts, 60 Hz, single phase. Unit heater shall be UL listed and CSA certified.

## PART 3 EXECUTION

### 3.1 EQUIPMENT INSTALLATION

Unless otherwise indicated, all equipment shall be installed in accordance with the manufacturer's recommendations.

### 3.2 CLEANING AND ADJUSTING

Equipment shall be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided for all fans that are operated during construction, and after all construction dirt has been removed from the building, new filters shall be installed. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. Miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed.

### 3.3 TESTING

After cleaning, the system shall be tested as a whole to see that all items perform as an integral part of the system, and that temperatures and conditions are evenly controlled throughout the space. Corrections and adjustments shall be made as necessary to produce the conditions indicated.

### 3.4 WARRANTY

The Contractor shall furnish, to the Contracting Officer, the manufacturer's standard warranty or guaranty for the equipment and materials installed under this section of the specifications. Upon receipt of notice from the Government of failure of any part of the guaranteed materials or equipment during the guaranty period, new replacement part or parts shall be furnished and installed promptly by the Contractor at no additional cost to the Government.

--End of Section--

DIVISION 16 - ELECTRICAL

SECTION 16264

DIESEL-GENERATOR SET

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DIVISION 16 - ELECTRICAL

SECTION 16264

DIESEL-GENERATOR SET

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all plant, labor, material and equipment and furnishing, delivering, installing and testing a diesel-generator set meeting the Diesel-Generator Set Parameter Schedule in paragraph 1.4.1 below and of the latest commercial type and design, together with weatherproof enclosure, baseframe to support the diesel-generator set, all necessary controls, fuel tank, accessories and parts, not including any necessary station control center, complete as shown on the contract drawings and specified herein.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Shop tests

(2) Inspection

Inspection of the unit for damage and defects just prior to installation

(3) Installation

Installation of the unit including the diesel-generator set, necessary controls, accessories and miscellaneous parts.

(4) Field Tests

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

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 C12.11

(1987; R 1993) Instrument Transformers  
for Revenue Metering, 10 kV BIL through  
350 kV BIL (0.6 kV NSV through 69 kV  
NSV)

ANSI C39.1 (1981; R 1992) Requirements for  
Electrical Analog Indicating  
Instruments

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53 (1996) Pipe, Steel, Black and Hot-  
Dipped, Zinc-Coated, Welded and  
Seamless

ASTM A 106 (1995) Seamless Carbon Steel Pipe for  
High-Temperature Service

ASTM A 135 (1996) Electric-Resistance-Welded Steel Pipe

ASTM A 181/A 181M (1995b) Carbon Steel Forgings for  
General-Purpose Piping

ASTM A 234/A 234M (1996b) Piping Fittings of Wrought Carbon  
Steel and Alloy Steel for Moderate and  
Elevated Temperatures

ASTM B 395 (1995) U-Bend Seamless Copper and Copper  
Alloy Heat Exchanger and Condenser  
Tubes

ASTM D 975 (1996a) Diesel Fuel Oils

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.3 (1992) Malleable Iron Threaded Fittings

ASME B16.5 (1996) Pipe Flanges and Flanged Fittings  
NPS 1/2 thru NPS 24

ASME B16.11 (1991) Forged Fittings, Socket-Welded and Threaded

ASME B31.1 (1995; B31.1a; B31.1b) Power Piping

ASME BPV VIII Div 1 (1995; Addenda Dec 1995, Dec 1996)  
Boiler and Pressure Vessel Code Section  
VIII, Pressure Vessels Division 1 –  
Basic Coverage

ASME BPV IX (1995; Addenda Dec 1995, Dec 1996) Boiler  
and Pressure Vessel Code; Section IX,  
Welding and Brazing Qualifications

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (1997) National Electrical Safety Code

IEEE Std 43 (1974; R 1991) Testing Insulation Resistance of Rotating Machinery

IEEE Std 115 (1995) Test Procedures for Synchronous Machines

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58 (1993) Pipe Hangers and Supports – Materials, Design and Manufacture

MSS SP-69 (1996) Pipe Hangers and Supports – Selection and Application

MSS SP-80 (1997) Bronze Gate, Globe, Angle and Check Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1 (1993) Molded Case Circuit Breakers and Molded Case Switches

NEMA ICS 2 (1993) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated Not More Than 2,000 Volts AC or 750 Volts DC

NEMA ICS 6 (1993) Industrial Control and Systems, Enclosures

NEMA MG 1 (1993; Rev 1; Rev 2; Rev 3) Motors and Generators

NEMA PB 1 (1990) Panelboards

NEMA SG 3 (1995) Power Switching Equipment

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30 (1996; Errata) Flammable and Combustible Liquids Code

NFPA 37 (1997) Installation and Use of Stationary Combustion Engines and Gas Turbines

NFPA 70 (1999) National Electrical Code

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE ARP 892 (1994; R 1994) D-C Starter-Generator, Engine

SAE J 537 (1994) Storage Batteries

UNDERWRITERS LABORATORIES (UL)

UL 489 (1996; Rev May 1997) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

UL 891 (1994; Rev thru Jan 1995) Dead-Front Switchboards

## 1.4 SYSTEM DESCRIPTION

The diesel-generator set shall be provided and installed complete and totally functional, with all necessary ancillary equipment to include air filtration; starting system; generator controls, protection, and isolation; instrumentation; lubrication; fuel system; cooling system; and engine exhaust system. The diesel-generator set shall satisfy the requirements specified in the Diesel-Generator Set Parameter Schedule.

## 1.4.1 Diesel-Generator Set Parameter Schedule

Service Load	50 kW Minimum
Power Factor	1.0
Motor Starting kVA	30 kVA Minimum
Maximum Speed	1800 rpm Maximum
Diesel-Generator Set	stand-alone
Engine Cooling Type	water/ethylene glycol
Heat Exchanger Type	fin-tube
Governor Type	Isochronous
Frequency Bandwidth	plus/minus 0.4 percent steady state
Governor Type	Electronic
Frequency Regulation	1.00 percent (maximum) (No load to full load)
Frequency Bandwidth	plus/minus 0.25 percent (steady state)
Voltage Regulation	plus/minus 1 percent (maximum) (No load to full load)
Voltage Bandwidth	plus/minus 1 percent steady state)
Frequency	60 Hz
Voltage	230/115 volts a.c.
Phases	1 Phase
Minimum Generator	1 percent Subtransient Reactance

Nonlinear Loads	3 kVA
Max Step Load Increase	100 percent of Service load at 1.0 PF
Max Step Load Decrease	100 percent of Service Load at 1.0 PF (without shutdown)
Max Summer Outdoor Temp	110 degrees F (Ambient)
Min Winter Outdoor Temp	0 degrees F (Ambient)
Weatherproof Enclosure	Corrosion resistant
Seismic Zone	3
Installation Elevation	325 feet above sea level

#### 1.4.2 Output Capacity

The diesel-generator set shall provide power equal to the sum of service load plus the machine's efficiency loss and associated ancillary equipment loads. Rated output capacity shall also consider engine and/or generator oversizing required to meet requirements in paragraph 1.4.1 above for the Diesel-Generator Set Parameter Schedule.

#### 1.4.3 Power Applications

The diesel-generator set application shall be capable of 500 cumulative hours of operation per year with a maximum period of continuous operation of 300 hours at output capacity.

### 1.5 GENERAL REQUIREMENTS

#### 1.5.1 Diesel-Generator Set

The diesel generator-set shall consist of one engine, one generator, and one exciter, mounted, assembled, and aligned on one base; and all other necessary ancillary equipment which may be mounted separately. Set shall be assembled and attached to the base prior to shipping. Set components shall be environmentally suitable for the locations shown and shall be the manufacturer's standard product offered in catalogs for commercial or industrial use. A generator strip heater shall be provided for moisture control when the generator is not operating.

#### 1.5.2 Nameplates

Each major component of this specification shall have the manufacturer's name, type or style, model or serial number, and rating number on a plate secured to the equipment. As a minimum, nameplates shall be provided for:

Engine	Relays
Generator	Day tanks
Transformers (CT & PT)	Regulators
Pumps and pump motors	Governor
Generator Breaker	Economizer
Heat exchanger (other than base-mounted)	

### 1.5.3 Personnel Safety Device

Exposed moving parts, parts that produce high operating temperatures, parts which may be electrically energized, and parts that may be a hazard to operating personnel during normal operation shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. The safety devices shall be installed so that proper operation of the equipment is not impaired.

### 1.5.4 Verification of Dimensions

Before performing work, the premises shall be visited and all details of the work verified. The Contracting Officer shall be advised in writing of any discrepancies before performing any work.

### 1.5.5 Conformance to Codes and Standards

Where equipment is specified to conform to requirements of any code or standard such as UL, the design, fabrication and installation shall conform to the code.

### 1.5.6 Diesel-Generator Set Enclosure

The diesel-generator set enclosure shall be corrosion resistant and fully weather resistant. The enclosure shall contain all set components and provide ventilation to permit operation at rated load under secured conditions. Doors shall be provided for access to all controls and equipment requiring periodic maintenance or adjustment. Removable panels shall be provided for access to components requiring periodic replacement. The enclosure shall be capable of being removed without disassembly of the diesel-generator set or removal of components other than exhaust system. The enclosure shall reduce the mechanical noise of the generator set to within the limits allowed by the Occupational Safety and Health Act (OSHA) for the occupancy of the facility

### 1.5.7 Vibration Isolation

The maximum diesel-generator set vibration in the horizontal, vertical and axial directions shall be limited to 6 mils (peak-peak RMS), with an overall velocity limit of RMS, for all speeds through 110% of rated speed. The diesel-generator set shall be provided with a vibration-isolation in accordance with the manufacturer's standard recommendation. Where the vibration-isolation system does not secure the base to the structure floor or unit foundation, seismic restraints shall be provided in accordance with the seismic 3 zone specified.

### 1.5.8 Experience

Each component manufacturer shall have a minimum of 3 years experience in the manufacture, assembly and sale of components used with diesel-generator sets for commercial and industrial use. The diesel-generator set manufacture/assembler shall have a minimum of 3 years experience in the manufacture, assembly and sale of diesel-generator sets for commercial and industrial use.

## 1.6 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 01330 - SUBMITTAL PROCEDURES:

SD-01 Data

Equipment Performance; "FIO".

- a. Calculations of the engine and generator output power capability, including efficiency and parasitic load data.
- b. The generator KO rating and short circuit capacity (both symmetric and asymmetric).
- c. Calculations for the capacity of the day tank.

#### Alarm Setpoints; As recommended by the manufacturer.

The magnitude of monitored values which define alarm or action setpoints, and the tolerance (plus and/or minus) at which the device activates the alarm or action.

#### Cooling Equipment and Performance; “FIO”.

- a. The maximum and minimum allowable inlet temperatures of the coolant fluid.
- b. The maximum allowable temperature rise in the coolant fluid through the engine.
- c. The minimum allowable inlet fuel temperature.

#### Manufacturer's Catalog Data; “FIO”.

Manufacturer's standard catalog data describing and depicting the diesel-generator set and all ancillary equipment in sufficient detail to demonstrate specification compliance.

#### Vibration-Isolation; “FIO”.

Vibration isolation system performance data for the range of frequencies generated by the diesel-generator set during operation from no load to full load and the maximum vibration transmitted to the floor. Description of seismic qualification of the diesel-generator mounting, base, and vibration isolation.

#### SD-04 Drawings

#### Layout and Shop Drawings; “GA”.

- a. Base-mounted equipment, complete with base and all attachments including anchor bolt template and recommended clearances for maintenance and operation.
- b. Starting system.
- c. Fuel system.
- d. Cooling system.
- e. Exhaust system.
- f. Electric wiring of relays, breakers, and switches including single line and wiring diagrams.
- g. Lubrication system, including piping, pumps, strainers, filters, electric heater, controls and wiring.
- h. Location, type, and description of vibration isolation devices.
- i. The safety system, including wiring schematics.
- j. One-line schematic and wiring diagrams of the generator, exciter, regulator, governor, and all instrumentation.

- k. Panel layouts.
- l. Mounting and support for the panel and major piece of electrical equipment.
- m. Diesel-generator set rigging points and lifting instructions.

**As-Built Drawings; “FIO”.**

Drawings which accurately depict the as-built configuration of the installation, upon acceptance of the diesel-generator set installation.

**SD-06 Instructions**

**Posted Data; “FIO”.**

Posted data including wiring and control diagrams showing the key mechanical and electrical control elements, and a diagrammatic layout of the system

**Instructions; “FIO”.**

Instructions including: the manufacturer's pre-start checklist and precautions; startup procedures for test mode, manual-start mode, and running checks, precautions and shutdown checks and procedures. Instructions shall include procedures for interrelated equipment (such as heat recovery systems, co-generation and load-shedding. Instructions shall be weatherproof, laminated in plastic, framed, and posted where directed.

**SD-08 Statements**

**Component Manufacturer; “FIO”.**

Each component manufacturer has a minimum of 3 years experience in the manufacture, assembly and sale of components used with the diesel- generator set for commercial and industrial use.

**Manufacturer Assembler; “FIO”.**

The diesel-generator set manufacturer/assembler has a minimum of 3 years experience in the manufacture, assembly and sale of stationary diesel diesel-generator sets for commercial and industrial use.

**Cooling System; “FIO”.**

Certification that the diesel-generator set and cooling system function properly in the ambient temperatures specified.

**Listing of Product Installations; “FIO”.**

A list of 5 similar diesel-generator set installations. The set used as a basis for the durability and reliability certification shall be identified in the list. The list shall give the name of installations, completion dates, and name, mailing address, and telephone number of a current point of contact.

**Onsite Inspections; “FIO”.**

A letter giving notice of the proposed dates of all onsite inspections.

**Onsite Test; “FIO”.**

A detailed description of the Contractor's proposed procedures for onsite tests.

### Installation Procedures; “FIO”.

A complete copy of the manufacturer's installation procedures. A detailed description of the manufacturer's recommended break-in procedure.

### SD-09 Reports

#### Onsite Test; “FIO”.

- a. A letter giving notice of the proposed dates of all onsite inspections and tests.
- b. A detailed description of the Contractor's proposed procedures for onsite tests.
- c. Six (6) copies of the onsite test data described below in 8-1/2 x 11 inch 3-ring binders with a separate section for each test. Sections shall be separated by dividers with tabs. Data plots shall be full size ( 8-1/2 x 11 inches minimum), showing all grid lines, with full resolution.
  - (1) A description of the procedures for onsite tests.
  - (2) A list of equipment used, with calibration certifications.
  - (3) A copy of measurements taken, with required plots and graphs.
  - (4) The date of testing.
  - (5) The parameters verified.
  - (6) The condition specified for the parameter.
  - (7) The test results, signed and dated.
  - (8) A description of all adjustments made.

### SD-13 Certificates

#### Prototype Tests ; “FIO”.

Manufacturer's standard certification that prototype tests were performed for the generator model proposed.

#### Reliability and Durability; “FIO”.

Documentation which cites engines and generators in similar service to demonstrate compliance with the requirements of this specification. Certification does not exclude annual technological improvements made by a manufacturer in his basic standard model set on which experience was obtained, provided parts interchangeability has not been substantially affected and his current standard model meets all the performance requirements of this specification. For the set, 2 like sets shall have performed satisfactorily in a stationary power application, independent and separate from the physical location of the manufacturer's and assembler's facilities, for a minimum of 2 consecutive years without any failure to start, including periodic exercise. The certification shall state that for the set proposed to meet this specification, there were no failures resulting in downtime for repairs in excess of 72 hours or any failure due to overheating during 2 consecutive years of service. Like sets are of the same model, speed, bore, stroke, number and configuration of cylinders, and output power rating. Like generators are of the same model, speed, pitch, cooling, exciter, voltage regulator and output power rating.

#### Emissions; "FIO".

A certification from the engine manufacturer stating that the engine emissions meet federal, state, and local regulations and restrictions specified.

#### Site Visit; "FIO".

A site visit letter stating the date the site was visited and listing discrepancies found.

#### Flywheel Balance; "FIO".

Manufacturer's certification that the flywheel has been statically and dynamically balanced and is capable of being rotated at 125 percent of rated speed without vibration or damage.

#### Standards Compliance; "FIO".

A letter stating that where materials or equipment are specified to comply with requirements of UL, or other standards, written proof of such compliance has been obtained. The label or listing of the specified agency, or 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 are acceptable as proof.

#### Factory Tests ; "FIO".

A certification that the diesel-generator set passed the factory tests and inspections and a list of the test and inspections.

#### Functional Facilities; "FIO".

A letter certifying that all facilities are complete and functional, that the system is fully functional, and that each item of equipment is complete, free from damage, adjusted, and ready for beneficial use.

### 1.7 STORAGE AND INSTALLATION

The Contractor shall properly protect material and equipment before, during, and after installation. Stored items shall be protected from the weather and contamination. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

### 1.8 OPERATION AND MAINTENANCE MANUALS

#### 1.8.1 Operation Manual

Three (3) copies of the operation manual in 8-1/2 x 11 inch three-ring binders shall be provided. Sections shall be separated by heavy plastic dividers with tabs which identify the material in the section. Drawings shall be folded blue lines, with the title block visible, and placed in 8-1/2 x 11 inch plastic pockets with reinforced holes. The manual shall include:

- a. Step-by-step procedures for system startup, operation, and shutdown;
- b. Drawings, diagrams, and single-line schematics to illustrate and define the electrical, mechanical, and hydraulic systems with their controls, alarms, and safety systems;
- c. Procedures for interface and interaction with the station control center and related systems.

## 1.8.2 Maintenance Manual

Three (3) copies of the maintenance manual containing the information described below in 8-1/2 x 11 inch three-ring binders shall be provided. Each section shall be separated by a heavy plastic divider with tabs. Drawings shall be folded, with the title block visible, and placed in plastic pockets with reinforced holes.

- a. Procedures for each routine maintenance item.
- b. Procedures for troubleshooting.
- c. Factory-service, take-down overhaul, and repair service manuals, with parts lists.
- d. The manufacturer's recommended maintenance schedule.
- e. A component list which includes the manufacturer's name, address, type or style, model or serial number, rating, and catalog number for the major components listed in paragraph GENERAL REQUIREMENTS, NAMEPLATES.
- f. A list of spare parts for each piece of equipment and a complete list of materials and supplies needed for operation.

## 1.9 SPECIAL TOOLS AND FILTERS

Two sets of special tools and two sets of filters required for maintenance shall be provided. Special tools are those that only the manufacturer provides, for special purposes, or to reach otherwise inaccessible parts. A suitable tool box shall be included.

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be as specified.

#### 2.1.1 Circuit Breakers, Low Voltage

NEMA AB 1, UL 489, and NEMA SG 3.

#### 2.1.2 Filter Elements (Fuel-oil, Lubricating-oil, and Combustion-air)

Manufacturer's standard.

#### 2.1.3 Instrument Transformers

ANSI C12.11.

#### 2.1.4 Pipe (Sleeves, Fuel/Lube-oil, Compressed-Air, Coolant and Exhaust)

ASTM A 53, ASTM A 106 or ASTM A 135, steel pipe. Pipe smaller than 2 inches shall be Schedule 80. Pipe 2 inches and larger shall be Schedule 40.

#### 2.1.5 Pipe Flanges and Fittings

- a. Pipe Flanges and Flanged Fittings: ASTM A 181/A 181M, Class 60, or ASME B16.5, Grade 1,

Class 150.

- b. Pipe Welding Fittings: **ASTM A 234/A 234M**, Grade WPB or WPC, Class 150, or **ASME B16.11**, 3000 lb.
- c. Threaded Fittings: **ASME B16.3**, Class 150.
- d. Valves: **MSS SP-80**, Class 150.
- e. Gaskets: Manufacturers Standard.

#### 2.1.6 Thermometer for Oil or Water Service

Flush-mounted dial with range to suit the service encountered, standard with the manufacturer.

#### 2.1.7 Pipe Hangers

**MSS SP-58** and **MSS SP-69**.

#### 2.1.8 Electrical Enclosures

##### 2.1.8.1 General

**NEMA ICS 6**.

##### 2.1.8.2 Panelboards

**NEMA PB 1**.

#### 2.1.9 Pressure Gauges

Manufacturer's Standard.

#### 2.1.10 Electric Motors

Electric motors shall conform to the requirements of **NEMA MG 1**. Motors shall have sealed ball bearings, a maximum speed of 1800 rpm and integral automatic or manual reset thermal overload protectors. Motors used indoors shall have drip proof frames; those used outside shall be totally enclosed. AC motors smaller or larger than 1/2 Hp shall be of the squirrel cage induction type for standard voltage of 115 and/or 230 volts AC, 60 Hz single phase power.

#### 2.1.11 Motor Controllers

Motor controllers and starters shall conform to the requirements of **NFPA 70** and **NEMA ICS 2**.

## 2.2 DIESEL ENGINE

The diesel engine shall operate on No. 2-D diesel conforming to **ASTM D 975**, shall be designed for stationary applications and shall be complete with ancillaries. The engine shall be a standard production model described in the manufacturer's catalog. The engine shall be naturally aspirated, scavenged, supercharged or turbocharged. The engine shall be two- or four-stroke-cycle and compression-ignition type. The engine shall be vertical inline, V-, or opposed-piston type, with a solid cast block or individually cast cylinders. The engine shall have a minimum of two cylinders. Opposed-piston type engines shall have no less than four cylinders. Each block shall have a coolant drain port. The engine shall be equipped with an overspeed sensor.

## 2.3 FUEL SYSTEM

The fuel system for the diesel-generator set shall conform to the requirements of [NFPA 30](#) and [NFPA 37](#) and contain the following elements.

### 2.3.1 Pumps

#### 2.3.1.1 Main Pump

The engine shall be provided with an engine driven pump. The pump shall supply fuel at a minimum rate of 200 percent of the expected fuel consumption at 110 percent of full rated output capacity.

#### 2.3.1.2 Auxiliary Fuel Pump

Auxiliary fuel pumps shall be provided to maintain fuel pressure in the main fuel header on the engine. The auxiliary pump shall be driven by a dc electric motor powered by the starting batteries. The auxiliary pump shall be automatically actuated by a pressure detecting device.

### 2.3.2 Filter

A minimum of one full flow fuel filter shall be provided for the engine. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

### 2.3.3 Relief/Bypass Valve

A relief/bypass valve shall be provided to regulate pressure in the fuel supply line, return excess fuel to a return line, and prevent the build-up of excessive pressure in the fuel system.

### 2.3.4 Day Tank

The engine shall be provided with an integral day tank. The day tank shall be provided with connections for fuel supply line, fuel return line, fuel overflow line, local fuel fill port, gauge, vent line, drain line, and float switch assembly for control. A fuel return line cooler shall be provided as recommended by the manufacturer and assembler. The temperature of the fuel returning to the day tank shall be below the flash point of the fuel. A temperature sensing device shall be installed in the fuel supply line. The diesel-generator set provided with weatherproof enclosure shall have its day tank mounted within the enclosure.

#### 2.3.4.1 Capacity, Standby

The day tank shall have capacity to supply fuel to the engine for an uninterrupted 24-hour period at 100 percent rated load without being refilled, plus any fuel which may be returned to the main fuel storage tank. The calculation of the capacity of the day tank shall incorporate the requirement to stop the supply of fuel into the day tank at 90 percent of the ultimate volume of the tank.

#### 2.3.4.2 Drain Line

The day tank drain line shall be accessible and equipped with a shutoff valve. Self supporting day tanks shall be arranged to allow drainage into a 12 inch tall bucket.

#### 2.3.4.3 Local Fuel Fill

The local fuel fill port on the day tank shall be provided with a screw-on cap.

#### 2.3.4.4 Fuel Level Controls

- a. The day tank shall have a float-switch-assembly to perform the following functions:
- (1) Start the supply of fuel into the day tank when the fuel level is at the "Low" level mark, 75 percent of the total tank capacity.
  - (2) Stop the supply of fuel into the day tank when the fuel level is at 90 percent of the total tank capacity.
  - (3) Activate the "Overfill Fuel Level" alarm at 95 percent of the total tank volume.
  - (4) Activate the "Low Fuel Level" alarm at 70 percent of the total tank volume.
  - (5) Activate the automatic fuel supply shut-off valve located on the fill line of the day tank and shut down the fuel pump which supplies fuel to the day tank at 95 percent of the total tank volume. The flow of fuel shall be stopped before any fuel can be forced into the fuel overflow line.

#### 2.3.4.5 Arrangement

The integral day tank may allow gravity flow into the engine. Gravity flow tanks shall be provided with an internal or external valve located as near as possible to the shell of the tank. The valve shall close when the engine is not operating. The integral day tank shall be provided with any necessary pumps to supply fuel to the engine as recommended by the generator set manufacturer or the overflow connection and the fuel supply line for integral day tanks which do not rely upon gravity flow shall be arranged so that the highest possible fuel level is below the fuel injectors. The self-supporting day tank shall either be arranged so that the fuel level in the day tank remains above the suction port of the engine driven fuel pump or be provided with a transfer pump to provide fuel to the engine driven pump. The overflow connection and fuel supply line shall be arranged so that the highest possible fuel level is below the fuel injectors. The fuel supply line from the day tank to the manufacturer's standard engine connection shall be welded pipe.

#### 2.3.5 Fuel Supply System

The fuel supply line shall be routed from the main diesel storage tank to the diesel-generator day tank.

### 2.4 LUBRICATION

The engine shall have a separate lube-oil system conforming to [NFPA 30](#) and [NFPA 37](#). The system shall be pressurized by engine-driven oil pumps. The system shall be furnished with a relief valve for oil pressure regulation and a dip-stick for oil level indications. The crankcase shall be vented in accordance with the manufacturer's recommendation except that it shall not be vented to the engine exhaust system. The system shall be readily accessible for service such as draining, refilling, etc. The system shall permit addition of oil and have oil-level indication with the set operating. The system shall utilize an oil cooler as recommended by the engine manufacturer.

#### 2.4.1 Filter

One full-flow filter shall be provided for each pump. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

#### 2.4.2 Lube-Oil Sensors

The engine shall be equipped with lube-oil temperature and pressure sensors. Temperature sensors shall provide signals for pre-high and high lube oil indication and alarms. Pressure sensors shall be located downstream of the filters and provide signals for pre-low and low lube oil indication and alarms.

## 2.5 COOLING

The diesel engine cooling system shall operate automatically while the engine is running. The cooling system shall be sized for the maximum summer outdoor design temperature and site elevation. Water-cooled system coolant shall use a combination of water and ethylene-glycol sufficient for freeze protection at the minimum winter outdoor temperature specified. The maximum temperature rise of the coolant across the engine shall be no more than that recommended and submitted in accordance with paragraph SUBMITTALS.

### 2.5.1 Coolant Pumps

Coolant pumps shall be the centrifugal type. The engine shall have an engine-driven primary pump. Secondary pumps shall be electric motor driven and have automatic controllers.

### 2.5.2 Heat Exchanger

The heat exchanger shall be of a size and capacity to limit the maximum allowable temperature rise in the coolant across the engine to that recommended and submitted in accordance with paragraph SUBMITTALS for the maximum summer outdoor design temperature and site elevation. The heat exchanger shall be corrosion resistant, suitable for service in ambient conditions of application.

#### 2.5.2.1 Fin-Tube-Type Heat Exchanger (Radiator)

Heat exchanger may be factory coated with corrosive resistant film providing that corrosion measures are taken to restore the heat rejection capability of the radiator to the initial design requirement via oversizing, or other compensating methods. Internal surfaces shall be compatible with liquid fluid coolant used. Materials and coolant are subject to approval by the Contracting Officer. Heat exchangers shall be pressure type incorporating a pressure valve, vacuum valve and a cap. Caps shall be designed for pressure relief prior to removal. The heat exchanger and the entire cooling system shall be capable of withstanding a minimum pressure of 7 psi. The heat exchanger shall be protected with a strong grille or screen guard. The heat exchanger shall have at least two tapped holes. One tapped hole in the heat exchanger shall be equipped with a drain cock, the rest shall be plugged.

### 2.5.3 Expansion Tank

The cooling system shall include an air expansion tank which will accommodate the expanded water of the system generated within the normal operating temperature range, limiting the pressure increase at all components in the system to the maximum allowable pressure at those components. The tank shall be suitable for an operating temperature of 250 degrees F and a working pressure of 125 psi. The tank shall be constructed of welded steel, tested and stamped in accordance with ASME BPV VIII Div I for the stated working pressure. A bladder type tank shall not be used. The tank shall be supported by steel legs or bases for vertical installation or steel saddles for horizontal installation.

### 2.5.4 Temperature Sensors

The engine shall be equipped with coolant temperature sensors. Temperature sensors shall provide signals for pre-high and high indication and alarms.

## 2.6 SOUND LIMITATIONS

The limits listed are applicable only as referenced in this specification.

Frequency Ba (Hz)	Maximum Acceptable Sound Level (Decibels)	
	Industrial	Residential

20-75	87	81
75-150	77	71
150-300	70	64
300-600	64	58
600-1,200	61	55
1,200-2,400	60	54
2,400-4,800	60	54
4,800-10 kHz	62	56

## 2.7 AIR INTAKE EQUIPMENT

Filters and silencers shall be provided in locations that are convenient for servicing. The silencer shall be of the high-frequency filter type, located in the air intake system as recommended by the engine manufacturer. Silencer shall be capable of reducing the noise level at the air intake to a point below the maximum acceptable levels specified in paragraph SOUND LIMITATIONS. A combined filter-silencer unit meeting requirements for the separate filter and silencer items may be provided. Expansion elements in air-intake lines shall be rubber.

## 2.8 EXHAUST SYSTEM

The system shall be separate and complete for the engine. Piping shall be supported so as to minimize vibration. Where a V-type engine is provided, a V-type connector with necessary flexible sections and hardware shall connect the engine exhaust outlets.

### 2.8.1 Flexible Sections and Expansion Joints

A flexible section at the engine and an expansion joint at the muffler shall be provided. Flexible sections and expansion joints shall have flanged connections. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellows type. Expansion and flexible elements shall be stainless steel suitable for diesel-engine exhaust gas at 1000 degrees F. Expansion and flexible elements shall be capable of absorbing vibration from the engine and compensation for thermal expansion and contraction.

### 2.8.2 Exhaust Muffler

A chamber type exhaust muffler shall be provided. The muffler shall be constructed of welded steel and designed for outside vertical [horizontal] mounting. Eyebolts, lugs, flanges, or other items shall be provided as necessary for support in the location and position indicated. Pressure drop through the muffler shall not exceed the recommendations of the engine manufacturer. Outside mufflers shall be zinc coated or painted with high temperature 400 degrees F resisting paint. The muffler and exhaust piping together shall reduce the noise level to less than the maximum acceptable level listed for sound limitations in paragraph SOUND LIMITATIONS, at a distance of 75 feet from the end of the exhaust piping directly along the path of discharge for horizontal discharged exhausts; or at a radius of 75 feet from the muffler/discharge piping, at 45 degrees apart in all directions, for vertically discharged exhausts, with the diesel-generator set operating at 100 percent of the rated output capacity. The muffler shall have a drain valve, nipple, and cap at the low-point of the muffler.

### 2.8.3 Exhaust Piping

Horizontal sections of exhaust piping shall be sloped downward away from the engine to a condensate trap and drain valve. Changes in direction shall be long-radius. Exhaust piping, mufflers and silencers installed inside any building shall be insulated in accordance with paragraph THERMAL INSULATION and covered to protect personnel. Vertical exhaust piping shall be provided with a hinged, gravity operated, self-closing, rain cover.

## 2.9 EMISSIONS

The finished installation shall comply with Federal and local regulations and restrictions regarding the limits of emissions, as listed in the U.S. EPA Non-Road Sources Standard.

## 2.10 STARTING SYSTEM

### 2.10.1 Controls

An engine start-stop switch shall be provided with functions including: manual-automatic-run/stop, manual-start/run, manual stop, off/reset. Start-stop logic shall be provided for adjustable cycle cranking and cool down operation. The logic shall be arranged for manual starting. Electrical starting systems shall be provided with an adjustable cranking limit device to limit cranking periods from 8 seconds up to the maximum duration.

### 2.10.2 Capacity

The starting system shall be of sufficient capacity, at the maximum outdoor summer temperature specified to crank the engine without damage or overheating. The system shall be capable of providing a minimum of three cranking periods with 8-second intervals between cranks. The cranking period shall have a maximum duration of 8 seconds. The system shall be capable of providing one 30-second cranking period.

### 2.10.3 Functional Requirements

An electrical starting system shall be provided to operate on a 12 volt dc system utilizing a negative circuit ground. Starting motors shall be in accordance with [SAE ARP 892](#).

### 2.10.4 Battery

A starting battery system shall be provided and shall include the battery, battery rack, intercell connectors, and spacers. The battery shall be in accordance with [SAE J 537](#). Critical system components (rack, protection, etc.) shall be sized to withstand the seismic acceleration forces of the zone specified. The battery shall be lead-acid type, with sufficient capacity, at the minimum outdoor winter temperature specified to provide the specified cranking periods.

### 2.10.5 Battery Charger

A current-limiting battery charger, conforming to [UL 1236](#), shall be provided and shall automatically recharge the batteries. The charger shall be capable of an equalize charging rate for recharging fully depleted batteries within 24 hours and a float charge rate for maintaining the batteries in prime starting condition. An ammeter shall be provided to indicate charging rate. A timer shall be provided for the equalize charging rate setting.

### 2.10.6 Starting Aids

#### 2.10.6.1 Glow Plugs

Glow plugs shall be designed to provide sufficient heat for combustion of fuel within the cylinders to guarantee starting at an ambient temperature of minus 25 degrees F.

#### 2.10.6.2 Jacket-Coolant Heaters

A thermostatically controlled electric heater shall be mounted in the engine coolant jacketing to automatically maintain the coolant within plus or minus 3 degrees of the control temperature. The heater shall operate independently of engine operation so that starting times are minimized. The control temperature shall be the temperature recommended by the engine manufacturer to meet the starting time specified.

### 2.10.6.3 Lubricating-Oil Heaters

A thermostatically controlled electric heater shall be mounted in the engine lubricating-oil system to automatically maintain the oil temperature within plus or minus 3 degrees of the control temperature. The heater shall operate independently of engine operation so that starting times are minimized. Power for the heaters shall be 230 volts ac.

## 2.11 GOVERNOR

The diesel engine shall be provided with a isochronous governor which maintains the frequency within a bandwidth of the rated frequency, over a steady-state load range of zero to 100 percent of rated output capacity. The governor shall be configured for safe manual adjustment of the speed/frequency during operation of the diesel-generator set, without special tools, from 90 to 110 percent of the rated speed/frequency.

### 2.11.1 Governor Performance

### 2.11.2 Isochronous Governor

The isochronous governors shall maintain the midpoint of the frequency bandwidth at the same value for steady-state loads over the range of zero to 100 percent of rated output capacity. The governor shall be provided with speed electronic adjustment, configured for safe, manual, external adjustment of the droop from zero to 8 percent.

## 2.12 GENERATOR

The generator shall be of the synchronous type, one or two bearing, conforming to **NEMA MG 1**, equipped with winding terminal housings in accordance with **NEMA MG 1**, equipped with an amortisseur winding, and directly connected to the engine. Insulation shall be Class H. Generator design shall protect against mechanical, electrical and thermal damage due to vibration, 25 percent overspeeds, or voltages and temperatures at a rated output capacity of 100 percent. Generator ancillary equipment shall meet the short circuit requirements of **NEMA MG 1**. Frames shall be the drip-proof type. A generator field discharge resistor shall be provided if required by the generator manufacturer.

### 2.12.1 Current Balance

At 100 percent rated load, and load impedance equal for each of the three phases, the permissible current difference between any two phases shall not exceed 2 percent of the largest current on either of the two phases.

### 2.12.2 Voltage Balance

At any balanced load between 75 and 100 percent of rated load, the difference in line-to-neutral voltage among the three phases shall not exceed 1 percent of the average line-to-neutral voltage. For a single-phase load condition, consisting of 25 percent load at unity power factor placed between any phase and neutral with no load on the other two phases, the maximum simultaneous difference in line-to-neutral voltage between the phases shall not exceed 3 percent of rated line to neutral voltage. The single-phase load requirement shall be valid utilizing normal exciter and regulator control. The interpretation of the 25 percent load for single phase load conditions means 25 percent of rated current at rated phase voltage and unity power factor.

### 2.12.3 Waveform

The deviation factor of the line-to-line voltage at zero load and at balanced full rated load at 0.8 power factor shall not exceed 10 percent. The RMS of all harmonics shall be less than 5.0 percent and that of any one harmonic less than 3.0 percent at full rated load.

## 2.13 EXCITER

The generator exciter shall be of the brushless type. Semiconductor rectifiers shall have a minimum safety factor of 300 percent for peak inverse voltage and forward current ratings for all operating conditions, including 110 percent generator output at 104 degrees F ambient. The exciter and regulator in combination shall maintain generator-output voltage within the limits specified. The exciter shall maintain output current at the level and duration required to trip the generator breaker (IEEE Device 52) under fault conditions.

## 2.14 VOLTAGE REGULATOR

The generator shall be provided with a solid-state voltage regulator, separate from the exciter. Regulator shall be configured for safe manual adjustment of the generator voltage output without special tools, during operation from 90 to 110 percent of the rated voltage. Regulation drift shall not exceed plus or minus 0.5 percent for an ambient temperature change of 36 degrees F.

### 2.14.1 Steady State Performance

The voltage regulator shall have a maximum droop of 3 percent of rated voltage over a load range from 0 to 100 percent of rated output capacity and automatically maintain the generator output voltage within the specified operational bandwidth.

### 2.14.2 Regulator Bandwidth

Regulators shall have an operational bandwidth of plus or minus 1 percent of rated voltage.

## 2.15 GENERATOR PROTECTION

Short circuit and overload protection for the generator shall be provided. The generator circuit breaker (IEEE Device 52) ratings shall be consistent with the generator rated voltage and frequency, with continuous, short circuit and interrupting current ratings to match the generator capacity. The manufacturer shall determine the short circuit current interrupting rating of the breaker. The breaker shall be engine generator base mounted by the diesel-generator set manufacturer. Molded case breakers shall be provided with shunt trip. Surge protection shall be provided for each phase of the generator, to be mounted at the generator terminals.

### 2.15.1 Panelboard

Panelboard shall be metal-enclosed, general purpose, 1-phase, 3-wire, 240 volt rated, with neutral bus and continuous ground bus, conforming to **NEMA PB 1** and **UL 891**. Neutral bus and ground bus capacity shall be full capacity. Enclosure designs, construction, materials and coatings shall be suitable for the application and environment. Bus continuous current rating shall be at least equal to the generator rating and correspond to UL listed current ratings specified for panelboards and switchboards. Current withstand the short circuit rating and shall match the generator capacity. Buses shall be copper.

### 2.15.2 Devices

Switches, circuit breakers, fuses, relays, station control center and other protective devices shall be specified on the diesel-generator set and included in the submittal from the Contractor.

## 2.16 SAFETY SYSTEM

Devices, wiring, remote annunciator panels, etc., shall be provided and installed as a complete system to automatically activate the appropriate signals and initiate the appropriate actions. The safety system shall be provided with a self test method to verify its operability. Alarm signals shall include manual acknowledgement and reset devices. The alarm signal systems shall reactivate for new signals after acknowledgement is given to any signal. The systems shall be configured so that loss of any monitoring device shall result in an alarm on that system element.

## 2.17 PANELS

The control panels shall be of the type necessary to provide specified functions. Panels shall be mounted on the engine generator set base by vibration/shock absorbing type mountings. Instruments shall be mounted flush or semiflush. Convenient access to the back of instruments shall be provided to facilitate maintenance. Instruments shall be calibrated using recognized industry calibration standards. Each panel shall be provided with a panel identification plate which clearly identifies the panel function as indicated. Each instrument and device on the panel shall be provided with a plate which clearly identifies the device and its function as indicated. Panels except the remote alarm panel can be combined into a single panel.

### 2.17.1 Enclosures

Enclosures shall be designed for the application and environment, conforming to [NEMA ICS 6](#), and provided with locking mechanisms which are keyed alike.

### 2.17.2 Analog Instruments

Analog electrical indicating instruments shall be true RMS indicating in accordance with [ANSI C39.1](#) with semiflush mounting. The station control center panel-mounted instruments shall have 250 degree scales with an accuracy of not less than 1 percent. Unit-mounted instruments shall be the manufacturer's standard with an accuracy of not less than 2 percent. The instrument's operating temperature range shall be minus 20 to plus 65 degrees C. Distorted generator output voltage waveform of a crest factor less than 5 shall not affect metering accuracy for phase voltages, hertz and amps.

### 2.17.3 Electronic Instruments

Electronic indicating instruments shall be true RMS indicating, 100 percent solid state, microprocessor controlled to provide all specified functions. Control, logic, and function devices shall be compatible as a system, sealed, dust and water tight, and shall utilize modular components with metal housings and digital instrumentation. An interface module shall be provided to decode serial link data from the electronic panel and translate alarm, fault and status conditions to set of relay contacts. Instrument accuracy shall be not less than 2 percent for unit mounted devices and 1 percent for control room panel mounted devices, throughout a temperature range of minus 20 to plus 65 degrees C. Data display shall utilize LED or back lit LCD. Additionally, the display shall provide indication of cycle programming and diagnostic codes for troubleshooting.

### 2.17.4 Parameter Display

Continuous indication of the lubricating-oil pressure, ac voltmeter, ac ammeter, frequency meter, and coolant temperature.

### 2.17.5 Alarm Panel

The panel shall contain the following functions:

Function/Device	Alarm/Action
Red emergency stop (pushbutton or switch)	Shutdown
Day tank overfill limit indication (95 percent volume)	Problem shutdown (of pump supplying day tank)
Engine overspeed indication	Shutdown (110 percent of rated speed)

High-lube-oil temperature indicator	Shutdown (temperature as submitted)
Low-lube-oil pressure indication	Shutdown (pressure as submitted)
High coolant temperature indication	Shutdown (temperature as submitted)
Pre-low lube-oil pressure indication	Problem (110 percent of low lube oil pressure)
Pre-high coolant temperature indication	Problem (10 degrees F lower than coolant outlet shutdown temperature)
Pre-high lube-oil temperature indication	Problem ( 10 degrees F before shutdown)
Day tank low fuel limit indication	Problem (70 percent volume remaining)

#### 2.17.5.1 Audible Alarm

The audible alarm signal shall sound at a frequency of 70 Hz at a volume of 75 dB at 10 feet. The sound shall be continuously activated upon alarm and silenced upon acknowledgement. Audible alarm devices shall be located as shown.

#### 2.17.5.2 Visual Signal

The visual alarm signal shall be a panel light. The light shall be off in non-alarm status, flashing in alarm status, and change to continuously lit upon acknowledgment. For automatic shutdown, panel lights shall maintain alarm condition status to indicate the cause of failure. Visual signals shall not reset until the cause of the alarm has been cleared and/or restored to normal condition. Shutdown alarms shall be red, other alarms shall be amber.

#### 2.17.5.3 Alarms and Action Logic

a. Shutdown: Simultaneous activation of the audible signal, activation of the visual signals, stopping the engine, and opening the generator circuit breakers shall be accomplished.

b. Problem: Activation of the visual signal shall be accomplished.

#### 2.17.5.4 Time-Delay on Alarm

For startup of the diesel-generator set, time-delay devices shall be installed to bypass the low-lubricating oil pressure alarm, and the coolant fluid outlet temperature alarm during cranking. The lube-oil time-delay device shall return its alarm to normal status after the engine starts. The coolant time-delay device shall return its alarm normal status 5 minutes after the engine starts.

#### 2.17.6 Engine Panel

The panel shall be as specified in paragraph PANELS and shall contain the following items:

- a. Engine temperature display (coolant or cylinder).
- b. Lubricating-oil pressure indicator.
- c. Lubricating-oil temperature display.
- d. Run time meter.
- e. Engine manual-start/run, manual-stop, manual-automatic-start/stop, off/reset switches.
- f. Start attempt light indicator.

#### 2.17.7 Generator Panel

The panel shall contain the following items:

- a. Voltmeter, ac, 1-phase for the generator output.
- b. Ammeter, ac, 1-phase.
- c. Frequency meter, with a range of 90 to 110 percent of rated frequency. Vibrating-reed type meters shall not be used.
- d. Voltage regulator control.

#### 2.18 SURGE PROTECTION

Electrical and electronic components shall be protected from, or designed to withstand the effects of surges from switching and lightning.

#### 2.19 MANUAL DIESEL-GENERATOR SET SYSTEM OPERATION

Complete facilities shall be provided for manual starting and testing of the set without load, loading and unloading of the set.

#### 2.20 BASE

The base shall be constructed of steel. The base shall be designed to rigidly support the diesel-generator set, ensure permanent alignment of all rotating parts, be arranged to provide easy access to allow changing of lube-oil, and ensure that alignment will be maintained during shipping and normal operation. The base shall permit skidding in any direction during installation and shall be provided with suitable holes for foundation bolts. The base shall also withstand and mitigate the effects of synchronous vibration of the engine and generator, and shall be provided with suitable holes for anchor bolts ½ inch diameter holes for anchor bolts and jacking screws for leveling.

#### 2.21 PAINTING AND FINISHING

The diesel-generator set shall be cleaned, primed and painted in accordance with the manufacturer's standard color and practice.

#### 2.22 FACTORY INSPECTION AND TESTS

Factory inspection and tests shall be performed on the diesel-generator set proposed to meet this specification section. Inspections shall be completed and necessary repairs made prior to testing. Inspectors shall look for leaks, looseness, defects in components, and proper assembly. The following tests shall be performed on the diesel-

generator set (except where the component manufacturer's production tests are noted as acceptable). The load power factor for the tests shall be 1.0 power factor. Manufacturer's standard test instruments may be used as approved by the Contracting Officer. In the following tests where measurements are to be recorded after stabilization of an diesel-generator set parameter (voltage, frequency, current, temperature, etc.), stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings.

- a. Start-and-Stop Test. Record: the engine manufacturer's after-starting checks and inspections; readings of gauges and instruments; and the time to stop after activation of the manual emergency stop switch. The set shall operate for 5 minutes at rated voltage and frequency and no load prior to activation of the manual emergency stop switch.
- b. The diesel-generator-set shall be operated: at 50 percent of Service Load for at least 15 minutes; 75 percent of Service Load for at least 15 minutes; 100 percent of Service Load for at least 30 minutes. Readings of gauges and instruments shall be checked after each load change.
- c. Insulation Resistance for Stator and Exciter (Generator manufacturers production line test is acceptable). Performance criteria: **NEMA MG 1**, 22.51; using a method listed in **IEEE Std 43**; minimum resistance of 1 megohm, plus 1 megohm per 1000 volts of rated voltage for armature and field.
- d. Winding Resistance Test per **IEEE Std 115**. Generator manufacturer's production line test is acceptable.
- e. Overspeed Protective Device Test. The engine overspeed protective device and alarm shall be tested by adjustment of the governor to increase engine speed past the overspeed limit. The RPM at which the engine shuts down shall be recorded.
- f. Voltage Regulator Range Test. Perform and record engine manufacturer's recommended prestarting checks and inspections. Start the engine, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period. For the following steps, record the output line-line and line-neutral voltages and frequency after performing each step instruction (after stabilization of voltage and frequency).
  - (1) Apply load in steps no larger than the Maximum Step Load Increase to load the diesel-generator set to 100 percent of Service Load. Adjust voltage and frequency to rated voltage and frequency. No further adjustments to any set control for the remainder of this test except the control panel voltage adjust device.
  - (2) Remove load.
  - (2) While operating at 0 percent of Service Load, adjust the voltage regulator to 110 percent of rated voltage.
  - (4) Increase load from 0 to 100 percent of Service Load.
  - (5) Decrease load from 100 percent to 0 percent of Service Load.
  - (6) While operating at 0 percent of Service Load, adjust the voltage regulator to the maximum attainable voltage or to a value prior to actuation of the over-voltage protective device.
  - (7) Increase load from 0 to 100 percent of Service Load.
  - (8) Decrease load from 100 to 0 percent of Service Load.
  - (9) While operating at 0 percent of Service Load, adjust the voltage regulator to 90 percent of rated voltage.
  - (10) Increase load from 0 to 100 percent of Service Load.

- (11) Adjust the voltage regulator to the minimum attainable value or the value just prior to activation of the undervoltage protection device.
- g. Governor Adjustment Range Test. Perform and record engine manufacturer's recommended prestarting checks and inspections. Start the engine, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period. For the following steps, record the output line-line and line-neutral voltages and frequency after performing each step instruction (after stabilization of voltage and frequency). Operate for approximately 2 minutes at each step.
- (1) Make initial adjustments to the load, voltage and frequency to obtain rated values. No further adjustments may be made to any set control for the remainder of this test except the control panel frequency adjust device.
  - (2) While operating at rated voltage and 0 percent of Service Load, adjust the governor to 90 percent of rated frequency or just above the underfrequency trip setpoint.
  - (3) Increase load to 100 percent of Service Load in steps equal to the maximum step load increase.
  - (4) Decrease load from 100 to 0 percent of Service Load. Adjust the governor control to just below the engine overspeed trip setpoint.
  - (5) Apply 100 percent of Service Load in steps equal to the maximum step load increase and operate for approximately 2 minutes at each step.

## PART 3 EXECUTION

### 3.1 GENERAL

Installation shall provide clear space for operation and maintenance in accordance with [NFPA 70](#) and [IEEE C2](#). Installation of pipe, duct, conduit, and ancillary equipment shall be configured to facilitate easy removal and replacement of major components and parts of the diesel-generator set.

### 3.2 PIPING INSTALLATION

#### 3.2.1 General

Piping connections to the diesel-generator set shall be threaded. Connections at valves shall be flanged. Connections at equipment shall be flanged except that connections to the diesel engine may be threaded if the diesel-engine manufacturer's standard connection is threaded. Except as otherwise specified, flanged fittings shall be utilized to allow for complete dismantling and removal of the piping system from the facility without disconnecting or removing any portion of any other system's equipment or piping. Connections to all equipment shall be made with flexible connectors.

#### 3.2.2 Flanged Joints

Flanges shall be 125 pound type, drilled, and of the proper size and configuration to match equipment and diesel-engine connections. Gaskets shall be factory cut in one piece 1/16 inch thick.

#### 3.2.3 Cleaning

After fabrication and before assembly, piping interiors shall be manually wiped clean of all debris.

### 3.3 ELECTRICAL INSTALLATION

#### 3.3.1 Compliance

Electrical installation shall comply with **NFPA 70**, **IEEE C2**, and Section **16415 ELECTRICAL WORK, INTERIOR**.

#### 3.3.2 Vibration Isolation

Flexible fittings shall be provided for all conduits connected to the diesel-generator set.

### 3.4 ONSITE INSPECTION AND TESTS

#### 3.4.1 Instruments

Readings of panel gauges, meters, displays, and instruments, provided under this specification shall be verified during test runs by test instruments of precision and accuracy greater than the tested items. Test instrument accuracy shall be at least as follows: current, 1.5 percent; voltage, 1.5 percent; real power, 1.5 percent; reactive power, 1.5 percent; power factor, 3 percent; frequency, 0.5 percent. Test instruments shall be calibrated by a recognized standards laboratory within 90 days prior to testing.

#### 3.4.2 Sequence of Tests

The sequence of testing shall be as specified in the approved testing plan unless variance is authorized by the Contracting Officer. Field testing shall be performed in the presence of the Contracting Officer. Tests may be scheduled and sequenced in order to optimize run-time periods; however the following general order of testing shall be followed: Construction Tests; Inspections; Safety run Tests; and Performance Tests.

#### 3.4.3 Construction Tests

Individual component and equipment functional tests for fuel piping, coolant piping, and lubricating-oil piping, electrical circuit continuity, insulation resistance, circuit protective devices, and equipment not provided by the diesel-generator set manufacturer shall be performed prior to connection to the diesel-generator set.

#### 3.4.4 Piping Test

- a. Lube-oil and fuel-oil piping shall be flushed with the same type of fluid intended to flow through the piping until the outflowing fluid has no obvious sediment or emulsion.
- b. Piping which is external to the diesel generator set shall be pressure tested with air pressure at 150 percent of the maximum anticipated working pressure, but in no case less than 150 psig, for a period of 2 hours to prove the piping has no leaks. If piping is to be insulated, the test shall be performed before the insulation is applied.

#### 3.4.5 Electrical Equipment Tests

- a. Insulation integrity tests shall be performed for cables connecting the generator breaker to the station control center to insure the generator conductors are not shorted together.
- b. Ground-Resistance Tests shall be performed with a megger to test for shorted conductors.
- b. Circuit breakers shall be examined and tested in accordance with manufacturer's published instructions for functional testing.

### 3.5 INSPECTION ITEMS

The following inspections shall be performed jointly by the Contracting Officer and the Contractor, after complete installation of the diesel-generator set and its associated equipment, and prior to startup of the diesel-generator set. Checks applicable to the installation shall be performed. The results of those which are physical inspections (I) shall be documented by the Contractor and submitted in accordance with paragraph SUBMITTALS. The Contractor shall present manufacturer's data for the inspections designated (D) at the time of inspection. Inspections shall verify that equipment type, features, accessibility, installation and condition are in accordance with the contract specification. Manufacturer's statements shall certify provision of features which cannot be verified visually.

1. Drive belts. (I)
2. Governor type and features. (I)
3. Engine timing mark. (I)
4. Starting motor. (I)
5. Starting aids. (I)
6. Coolant type and concentration. (D)
7. Radiator drains. (I)
8. Block coolant drains. (I)
9. Coolant fill level. (I)
10. Coolant line connections. (I)
11. Coolant hoses. (I)
12. Combustion air filter. (I)
13. Intake air silencer. (I)
14. Lube oil type. (D)
15. Lube oil drain. (I)
16. Lube-oil filter. (I)
17. Lube-oil-fill level. (I)
18. Lube-oil line connections. (I)
19. Lube-oil lines. (I)
20. Fuel type. (D)
21. Fuel-level. (I)
22. Fuel-line connections. (I)
23. Fuel lines. (I)
24. Fuel filter. (I)
25. Access for maintenance. (I)
26. Voltage regulator. (I)
27. Battery-charger connections. (I)
28. Wiring & terminations. (I)
29. Instrumentation. (I)
30. Hazards to personnel. (I)
31. Base. (I)
32. Nameplates. (I)
33. Paint. (I)
34. Exhaust system. (I)
35. Access provided to controls. (I)
36. Enclosure. (I)
37. Engine & generator mounting bolts (proper application). (I)

### 3.6 SAFETY RUN TESTS

- a. Perform and record engine manufacturer's recommended prestarting checks and inspections.
- b. Start the engine, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- c. Activate the manual emergency stop switch and record the time to stop.
- d. Remove the high and pre-high lubricating oil temperature sensing elements from the engine and

temporarily install temperature gauge in their normal locations on the engine (required for safety, not for recorded data). Where necessary, provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.

- e. Start the engine, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set at no load until the output voltage and frequency stabilize. Monitor the temporarily installed temperature gauges. If temperature reading exceeds the value for an alarm condition, activate the manual emergency stop switch.
- f. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- g. Remove the high and pre-high coolant temperature sensing elements from the engine and temporarily seal their normal location on the engine and temporarily install temperature gauges in their normal locations on the engine (required for safety, not for recorded data). Where necessary provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.
- h. Start the engine, make and record engine manufacturer's after-starting checks and inspections and operate the diesel-generator set at no load until the output voltage and frequency stabilize.
- i. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- j. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- k. Operate the engine diesel-generator set for at least 30 minutes at 100 percent of service load.
- l. Verify proper operation of the governor and voltage regulator.
- m. Verify proper operation and setpoints of gauges and instruments.
- n. Verify proper operation of ancillary equipment.
- o. Manually adjust the governor to increase engine speed past the overspeed limit. Record the RPM at which the engine shuts down.
- p. Start the engine, make and record engine manufacturer's after-starting checks and inspections and operate the diesel-generator set for at least 15 minutes at 75 percent of rated load.
- q. Manually fill the day tank to a level above the overfill limit. Record the level at which the overfill alarm sounds. Verify shutdown of the fuel transfer pump. Drain the day tank down below the overfill limit.
- r. Shut down the engine. Remove the time-delay low lube oil pressure alarm bypass and try to start the engine. Record the results.
- s. Attach a manifold to the engine oil system that contains a shutoff valve in series with a connection for the engine's oil pressure sensor followed by an oil pressure gauge ending with a bleed valve. The engine's oil pressure sensor shall be moved from the engine to the manifold and its normal location on the engine temporarily sealed. The manifold shutoff valve shall be open and bleed valve closed.
- t. Start the engine, record the starting time, make and record all engine manufacturer's after-starting

checks and inspections and operate the diesel-generator set for at least 15 minutes at 75 percent of service load.

- u. Close the manifold shutoff valve. Slowly allow the pressure in the manifold to bleed off through the bleed valve while watching the pressure gauge. Record the pressure at which the engine shuts down. Catch oil spillage from the bleed valve in a container. Add the oil from the container back to the engine, remove the manifold, and reinstall the engine's oil pressure sensor on the engine.
- v. Start the engine, make and record all engine manufacturer's after-starting checks and inspections and operate the diesel-generator set for at least 15 minutes at 100 percent of service load. Record the maximum sound level in the frequency band at a distance of 75 feet from the end of the exhaust piping directly along the path of discharge for horizontally discharged exhausts, or at a radius of 75 feet from the engine at 45 degrees apart in all directions for vertically discharged exhausts.
- w. Manually drain off fuel slowly from the day tank to empty it to below the low fuel level limit and record the level at which the audible alarm sounds. Add fuel back to the day tank to fill it above low level alarm limits.
- x. Manually adjust the governor to speed up the engine to a level beyond the over frequency alarm setpoint and record the frequency when the audible alarm sounds. Manually adjust the governor to slow down the engine to a level below the under frequency alarm setpoint and record the frequency when the audible alarm sounds. Return the speed to the rated value. Shut down the diesel-generator set.

### 3.7 DIESEL-GENERATOR SET TESTS

#### 3.7.1 Performance Tests

The diesel-generator set and ancillary systems shall be tested at service load to: demonstrate durability; verify that heat of extended operation does not adversely affect or cause failure in any part of the system; and check all parts of the system. The engine load run test shall be accomplished principally during daylight hours, with an average ambient temperature of 70 degrees F. Data taken at 15 minutes intervals shall include the following:

Electrical: Output amperes, voltage, real and reactive power, power factor, frequency.

Pressure: Lube-oil

Temperature: Coolant

Lube-oil

Ambient

- a. Perform and record engine manufacturer's recommended prestarting checks and inspections. Include as a minimum checking coolant fluid, fuel, and lube-oil levels.
- b. Start the engine; make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- c. Operate the engine generator-set for at least 2 hours at 75 percent of service load.
- c. Increase load to 100 percent of service load and operate the engine generator-set for at least 2 hours.
- e. Remove load from the diesel-generator set.

#### 3.7.2 Load Acceptance Tests

Engine manufacturer's recommended prestarting checks and inspections shall be performed and recorded. The engine shall be started, and engine manufacturer's after-starting checks and inspections made and recorded during a reasonable warm-up period. For the following steps, the output line-line and line-neutral voltages and frequency shall be recorded after performing each step instruction (after stabilization of voltage and frequency).

- a. Apply 100 percent of the service electrical loads to the diesel generator set.
- b. Verify that the diesel-generator set responds to the full station electrical load and that the output voltage returns to and stabilizes within the rated bandwidths.

### 3.7.3 Final Inspection Tests

The pre-test inspection shall be performed and corrective actions taken. The unit shall be operated a minimum of 1/2 hour to demonstrate effectiveness of corrective actions.

## 3.8 MANUFACTURER'S FIELD SERVICE

### 3.8.1 Onsite Training

The Contractor shall conduct training course for operating staff as designated by the Contracting Officer. The training period shall consist of a total 1 hour of normal working time and shall start after the system is functionally completed but prior to final acceptance. The course instructions shall cover pertinent points involved in operating, starting, stopping, 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 such as oil change, oil filter change, and air filter change.

### 3.8.2 Acceptance

Final acceptance of the diesel-generator set 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--

DIVISION 16 - ELECTRICAL

SECTION 16415

ELECTRICAL WORK, INTERIOR

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DIVISION 16 - ELECTRICAL

SECTION 16415

ELECTRICAL WORK, INTERIOR

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all plant, labor, material and equipment and furnishing, delivering, installing and testing all interior electrical work including but not limited to the station control center, motor control centers, lighting fixtures, inferred heater, receptacles, switches, conductors, conduits and exterior lighting fixtures, underground service conductors, conduit, trenching, backfilling, ground conductors and appendices, all according to the National Electrical Code and local electrical requirements complete as shown on the contract drawings and specified herein.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Shop Tests

Shop tests of the station control center

(2) Inspection

Inspection on delivery of the station control center and other electrical items for damage and defects

(3) Installation

Installation of the station control center and other electrical equipment and materials

(4) Field Tests

Field tests and operation of the station control center and other electrical equipment and materials

### 1.3 APPLICABLE PUBLICATIONS

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 C12.1	(1995) Code for Electricity Metering
ANSI C12.4	(1984; R 1996) Mechanical Demand Registers
ANSI C12.10	(1987) Electromechanical Watt-hour Meters
ANSI C12.11	(1987; R 1993) Instrument Transformers for Revenue Metering, 10 kV BIL Through 350 kV BIL (0.6 kV NSV Through 69 kV NSV)
ANSI C39.1	(1981; R 1992) Requirements for Electrical Analog Indicating Instruments
ANSI C57.12.10	(1987) Safety Requirements for Transformers 230 kV and Below 833/958 Through 8333/10417 kVA, Single-Phase, and 750/862 Through 60 000/80 000/100 000 kVA, Three-Phase Without Load Tap Charging; and 3750/4687 Through 60 000/80 000/100 000 kVA With Load Tap Charging
ANSI C57.12.13	(1982) Conformance Requirements for Liquid-Filled Transformers Used in Unit Installations, Including Unit Substations
ANSI C57.12.27	(1982) Conformance Requirements for Liquid-Filled Distribution Transformers Used in Pad-Mounted Installations, Including Unit Substations
ANSI C57.12.50	(1981; R 1989) Ventilated Dry-type Distribution Transformers 1 to 500 kVA, Single-Phase; and 15 to 500 kVA, Three-Phase with High-Voltage 601 to 34 500 Volts, Low-Voltage 120 to 600 Volts
ANSI C57.12.51	(1981; R 1989) Ventilated Dry-Type Power Transformers, 501 kVA and Larger, Three-

Phase, with High-Voltage 601 to 34 500 Volts,  
Low-Voltage 208Y/120 to 4160 Volts

ANSI C57.12.52

(1981; R 1989) Sealed Dry-Type Power Transformers, 501 kVA and Larger, Three-Phase with High-Voltage 601 to 34 500 Volts, Low-Voltage 208Y/120 to 4160 Volts

ANSI C57.12.70

(1978; R 1993) Terminal Markings and Connections for Distribution and Power Transformers

ANSI C82.1

(1985; C82.1a; C82.1b; C82.1c; C82.1d; C82.1e; R 1992) Specifications for Fluorescent Lamp Ballasts

ANSI C82.4

(1992) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)

ANSI C135.30

(1988) Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 1

(1995) Hard-Drawn Copper Wire

ASTM B 8

(1995) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

ASTM D 709

(1992; R 1997) Laminated Thermosetting Materials

ASTM D 4059

(1996) Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography

#### CODE OF FEDERAL REGULATIONS (CFR)

47 CFR 18

Industrial, Scientific, and Medical Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(1997) National Electrical Safety Code
IEEE ANSI/IEEE C37.20.1	(1993) Metal-Enclosed Low-Voltage Power Circuit-Breaker Switchgear
IEEE ANSI/IEEE C57.12.80	(1978; R 1992) Terminology for Power and Distribution Transformers
IEEE ANSI/IEEE C57.12.90	(1993) Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers
IEEE ANSI/IEEE C57.13	(1993) Instrument Transformers
IEEE ANSI/IEEE C57.98	(1993) Guide for Transformer Impulse Tests
IEEE ANSI/IEEE C57.100	(1986; R 1992) Test Procedure for Thermal Evaluation of Oil-Immersed Distribution Transformers
IEEE C62.41	(1991; R 1995) Surge Voltages in Low-Voltage AC Power Circuits
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)
IEEE Std 242	(1986; R 1991) Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
IEEE Std 399	(1990) Recommended Practice for Industrial and Commercial Power Systems Analysis

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(1991) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA AB 1	(1993) Molded Case Circuit Breakers and Molded Case Switches
NEMA BU 1	(1994) Busways
NEMA FU 1	(1986) Low Voltage Cartridge Fuses
NEMA ICS 1	(1993) Industrial Control and Systems
NEMA ICS 3	(1993) Industrial Control and Systems Factory Built Assemblies
NEMA ICS 6	(1993) Industrial Control and Systems Enclosures
NEMA LE 4	(1987) Recessed Luminaires, Ceiling Compatibility
NEMA MG 1	(1993; Rev 1; Rev 2; Rev 3) Motors and Generators
NEMA OS 1	(1989) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
NEMA OS 2	(1986; Errata Aug 1986; R 1991) Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports
NEMA PB 1	(1990) Panelboards
NEMA PB 2	(1995) Deadfront Distribution Switchboards
NEMA PE 5	(1985; R 1991) Utility Type Battery Chargers
NEMA RN 1	(1989) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

NEMA ST 20	(1992) Dry-Type Transformers for General Applications
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; Errata 96-4) National Electrical Code
NFPA 101	(1997; Errata 97-1) Life Safety Code

#### UNDERWRITERS LABORATORIES (UL)

UL 1	(1993; Rev thru Jan 1995) Flexible Metal Conduit
UL 5	(1996) Surface Metal Raceways and Fittings
UL 6	(1997) Rigid Metal Conduit
UL 20	(1995; Rev thru Jan 1998) General-Use Snap Switches
UL 44	(1997; Rev Aug 1997) Thermoset-Insulated Wires and Cables
UL 50	(1995; Rev thru Oct 1997) Enclosures for Electrical Equipment
UL 67	(1993; Rev thru Nov 1995) Panelboards
UL 83	(1996; Rev Sep 1997) Thermoplastic-Insulated Wires and Cables
UL 98	(1994; R thru Oct 1995) Enclosed and Dead-Front Switches
UL 198B	(1995) Class H Fuses

UL 198C	(1986; Rev thru Feb 1998) High-Interrupting-Capacity Fuses, Current-Limiting Types
UL 198D	(1995) Class K Fuses
UL 198E	(1988; Rev Jul 1988) Class R Fuses
UL 198G	(1988; Rev May 1988) Fuses for Supplementary Overcurrent Protection
UL 198H	(1988; Rev thru Nov 1993) Class T Fuses
UL 198L	(1995; Rev May 1995) D-C Fuses for Industrial Use
UL 360	(1996; Rev thru Oct 1997) Liquid-Tight Flexible Steel Conduit
UL 467	(1993; Rev thru Aug 1996) Grounding and Bonding Equipment
UL 486A	(1997) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 486C	(1997) Splicing Wire Connectors
UL 489	(1996; Rev thru Nov 1997) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 506	(1994; Rev Oct 1997) Specialty Transformers
UL 508	(1993; Rev thru Oct 1997) Industrial Control Equipment
UL 510	(1994; Rev thru Nov 1997) Insulating Tape
UL 512	(1993; R Dec 1995) Fuseholders
UL 514A	(1996) Metallic Outlet Boxes

UL 514B	(1997) Fittings for Conduit and Outlet Boxes
UL 514C	(1996) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 542	(1994; Rev May 1997) Lampholders, Starters, and Starter Holders for Fluorescent Lamps
UL 651	(1995; Rev thru Apr 1997) Schedule 40 and 80 Rigid PVC Conduit
UL 651A	(1995; Rev Sep 1996) Type EB and A Rigid PVC Conduit and HDPE Conduit
UL 698	(1995; Rev thru Dec 1996) Industrial Control Equipment for Use in Hazardous (Classified) Locations
UL 817	(1994; Rev thru Aug 1997) Cord Sets and Power-Supply Cords
UL 845	(1995; Rev Feb 1996) Motor Control Centers
UL 854	(1996) Service-Entrance Cables
UL 857	(1994; Rev thru Nov 1996) Busways and Associated Fittings
UL 869A	(1993; Rev thru Apr 1996) Reference Standard for Service Equipment
UL 891	(1994; Rev thru Jan 1995) Dead-Front Switchboards
UL 924	(1995; Rev thru Oct 97) Emergency Lighting and Power Equipment
UL 935	(1995; Rev thru Apr 1997) Fluorescent-Lamp Ballasts
UL 943	(1993; Rev thru Mar 1997) Ground-Fault Circuit-Interrupters

UL 1004	(1994; Rev thru Feb 1997) Electric Motors
UL 1010	(1995; Rev thru Dec 1996) Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations
UL 1022	(1994) Line Isolation Monitors
UL 1029	(1994; Rev thru Sep 1995) High-Intensity-Discharge Lamp Ballasts
UL 1047	(1995; Rev May 1996) Isolated Power Systems Equipment
UL 1236	(1994; Rev thru Dec 1997) Battery Chargers for Charging Engine-Starter Batteries
UL 1449	(1985; Errata Apr 1986; Rev May 1995) Transient Voltage Surge Suppressors
UL 1564	(1993; Rev Apr 1994) Industrial Battery Chargers
UL 1570	(1995; Rev thru Jun 1997) Fluorescent Lighting Fixtures
UL 1571	(1995; Rev thru Jun 97) Incandescent Lighting Fixtures
UL 1572	(1995; Rev thru Jun 97) High Intensity Discharge Lighting Fixtures
UL 1660	(1994; Rev Jan 1996) Liquid-Tight Flexible Nonmetallic Conduit
UL Elec Const Dir	(1997) Electrical Construction Equipment Directory

## 1.4 GENERAL REQUIREMENTS

### 1.4.1 Rules

The installation shall conform to the requirements of [NFPA 70](#) and [NFPA 101](#), unless more stringent requirements are indicated or shown.

#### 1.4.2 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 Contractor shall coordinate electrical work with the HVAC and electrical drawings and specifications and provide power related wiring.

#### 1.4.3 Special Environments

Wiring, Fixtures, and equipment in designated locations shall conform to [NFPA 70](#) requirements for installation in damp or wet locations.

#### 1.4.4 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.

#### 1.4.5 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, identification nameplates shall be made of laminated plastic in accordance with [ASTM D 709](#) 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 front of the panelboard, motor control centers and station control center shall have a nameplate to indicate the phase letter,

corresponding color and arrangement of the phase conductors. 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
Station Control Center Transformers	
Equipment Enclosures	
Motors	

Each panel, section, or unit in station control center, 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."

#### 1.4.6 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.

### 1.5 SUBMITTALS

Government approval is required for submittals with a "FIO" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-01 Data

##### Fault Current and Protective Device Coordination Study, "FIO".

The study shall be submitted along with protective device equipment submittals. No time extensions or similar contract modifications will be granted for work arising out of the requirements for this study. Approval of protective devices proposed shall be based on recommendations of this study. The Government shall not be held responsible for any changes to equipment, device ratings, settings, or additional labor for installation of equipment or devices ordered and/or procured prior to approval of the study.

##### Manufacturer's Catalog "FIO".

Data composed of 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; “FIO”:

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 item.

#### Installation Procedures; “FIO”:

Installation procedures for rotating equipment, transformers, switchgear, battery systems, voltage regulators, and grounding resistors. Procedures shall include diagrams, instructions, and precautions required to install, adjust, calibrate, and test devices and equipment.

#### SD-04 Drawings

#### Interior Electrical Equipment; “FIO”:

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams, and other information necessary to define the installation. Detail drawings shall show the rating of items and systems and how the components of an item and system 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 show 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. Optional items shall be clearly identified as included or excluded. Detail drawings shall as a minimum include:

- a. Incoming electrical service.
- b. Station control center.
- c. Motor control centers.
- d. Motors.
- e. Single line electrical diagrams including secondary, metering,

sensing and relaying, control wiring, and control logic.

f. Battery system including calculations for the battery and charger.

g. Sway bracing for suspended lighting fixtures.

Structural drawings showing the structural or physical features of major equipment items, components, assemblies, and structures, including foundations or other types of supports for equipment and conductors. These drawings shall include accurately scaled or dimensioned outline and arrangement or layout drawings to show the physical size of equipment and components and the relative arrangement and physical connection of related components. Weights of equipment, components and assemblies shall be provided when required to verify the adequacy of design and proposed construction of foundations or other types of supports. Dynamic forces shall be stated for switching devices when such forces must be considered in the design of support structures. The appropriate detail drawings shall show the provisions for leveling, anchoring, and connecting all items during installation, and shall include any recommendations made by the manufacturer.

Electrical drawings including single-line and three-line diagrams, and schematics or elementary diagrams of each electrical system; internal wiring and field connection diagrams of each electrical device when published by the manufacturer; wiring diagrams of cabinets, panels, units, or separate mountings; interconnection diagrams that show the wiring between separate components of assemblies; field connection diagrams that show the termination of wiring routed between separate items of equipment; internal wiring diagrams of equipment showing wiring as actually provided for this project. Field wiring connections shall be clearly identified.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures, including changes in related portions of the project and the reasons why, shall be submitted with the detail drawings. Approved departures shall be made at no additional cost to the Government.

**As-Built Drawings; “FIO” ,2 sets.**

See Section 00800, paragraph 1.17.

**SD-08 Statements**

**Onsite Test; “FIO” .**

A detailed description of the Contractor's proposed procedures for on-site tests.

**SD-09 Reports**

**Factory Test Reports; “FIO” .**

Six (6) copies of the information described below in 8 1/2 x 11 inch binders having a minimum of 5 rings from which material may readily be removed and replaced, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The conditions specified for the test.
- f. The test results, signed and dated.
- g. A description of adjustments made.

**Field Test Plan; “FIO”.**

A detailed description of the Contractor's proposed procedures for onsite test submitted 20 days prior to testing the installed system. No field test will 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.

**Field Test Reports; “FIO”.**

Six (6) copies of the information described below in 8 1/2 x 11 inch binders having a minimum of 5 rings from which material may readily be removed and replaced, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The conditions specified for the test.
- f. The test results, signed and dated.

- g. A description of adjustments made.
- h. Final position of controls and device settings.

### SD-13 Certificates

#### Materials and Equipment; “FIO”:

The label or listing of the Underwriters Laboratories, Inc., will 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. Items which are required to be listed and labeled in accordance with Underwriters Laboratories must be affixed with a UL label that states that it is UL listed. No exceptions or waivers will be granted to this requirement. Materials and equipment will 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 standard of the American Society for Testing and Materials, National Electrical Manufacturers Association, or other commercial standard, is acceptable.

### 1.6 WORKMANSHIP

Materials and equipment shall be installed in accordance with **NFPA 70**, recommendations of the manufacturer, and as shown.

### PART 2 PRODUCTS

Products 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. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

#### 2.1 BUSWAYS

**UL 857**. Busses shall be copper. Enclosures shall be steel. Short-circuit ratings, except as indicated, shall be in accordance with **NEMA BU 1**.

#### 2.2 CABLES AND WIRES

Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid, except that conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be stranded unless specifically indicated otherwise. All conductor sizes shall be copper. Aluminum conductors shall not be used.

#### 2.2.1 Equipment Manufacturer Requirements

When manufacturer's equipment requires copper conductors at the terminations or requires copper conductors to be provided between components of equipment, provide copper conductors or splices, splice boxes, and other work required to meet manufacturer's requirements.

#### 2.2.2 Insulation

Unless indicated otherwise, or required by [NFPA 70](#), power and lighting wires shall be 600-volt, Type THWN, THHN, or THW conforming to [UL 83](#) or RHW conforming to [UL 44](#), except that grounding wire may be type TW conforming to [UL 83](#); remote-control and signal circuits shall be Type TW, THW or TF, conforming to [UL 83](#). Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

#### 2.2.3 Bonding Conductors

[ASTM B 1](#), solid bare copper wire for sizes No. 8 AWG and smaller diameter; [ASTM B 8](#), Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

#### 2.2.4 Service Entrance Cables

Service entrance (SE) and underground service entrance (USE) cables, [UL 854](#).

#### 2.2.5 Cord Sets and Power-Supply Cords

[UL 817](#).

### 2.3 TRANSIENT VOLTAGE SURGE PROTECTION

Transient voltage surge suppressors shall be provided as indicated. Surge suppressors shall meet the requirements of [IEEE C62.41](#) and be UL listed and labeled as having been tested in accordance with [UL 1449](#). Surge suppressor ratings shall be 400 volts rms minimum, operating voltage; 60 Hz; 1-phase; 3 wire with ground; transient suppression voltage peak let-through voltage of 400 volts. Fuses shall not be used as surge suppression.

### 2.4 CHARGERS, BATTERY

NEMA PE 5, UL 1236 and UL 1564. Battery chargers shall be installed in conformance with NFPA 70.

## 2.5 MOLDED-CASE CIRCUIT BREAKERS

Molded-case circuit breakers shall conform to NEMA AB 1 and UL 489 for circuit breakers and circuit breaker enclosures. Circuit breakers may be installed in the panelboard, station control center, enclosures, motor control centers, or combination motor controllers.

### 2.5.1 Construction

Circuit breakers shall be suitable for mounting and operating in any position. Lug shall be listed for copper conductors only. Single-pole circuit breakers shall be full module size with not more than one pole per module. Multi-pole circuit breakers shall be of the common-trip type having a single operating handle such that an overload or short circuit on any one pole will result in all poles opening simultaneously. Sizes of 100 amperes or less may consist of single-pole breakers permanently factory assembled into a multi-pole unit having an internal, mechanical, nontamperable common-trip mechanism and external handle ties. All circuit breakers shall have a quick-make, quick-break overcenter toggle-type mechanism, and the handle mechanism shall be trip-free to prevent holding the contacts closed against a short-circuit or sustained overload. All circuit breaker handles shall assume a position between "ON" and "OFF" when tripped automatically. All ratings shall be clearly visible.

### 2.5.2 Ratings

Voltage ratings shall be not less than the applicable circuit voltage. The interrupting rating of the circuit breakers shall be at least equal to the available short-circuit current at the line terminals of the circuit breaker and correspond to the UL listed integrated short-circuit current rating specified for the panelboards and switchboards. Molded-case circuit breakers shall have nominal voltage ratings, maximum continuous-current ratings, and maximum short-circuit interrupting ratings in accordance with NEMA AB 1. Ratings shall be coordinated with system X/R ratio.

### 2.5.3 Thermal-Magnetic Trip Elements

Thermal magnetic circuit breakers shall be provided as shown. Automatic operation shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. The instantaneous

magnetic trip shall be adjustable and accessible from the front of all circuit breakers on frame sizes above 150 amperes.

## 2.6 MOTOR SHORT-CIRCUIT PROTECTOR (MSCP)

Motor short-circuit protectors shall conform to [UL 508](#) and shall be provided as shown. Protectors shall be used only as part of a combination motor controller which provides coordinated motor branch-circuit overload and short-circuit protection, and shall be rated in accordance with the requirements of [NFPA 70](#).

### 2.6.1 Construction

Motor short-circuit protector bodies shall be constructed of high temperature, dimensionally stable, long life, nonhygroscopic materials. Protectors shall fit special MSCP mounting clips and shall not be interchangeable with any commercially available fuses. Protectors shall have 100 percent one-way interchangeability within the A-Y letter designations. All ratings shall be clearly visible.

### 2.6.2 Ratings

Voltage ratings shall be not less than the applicable circuit voltage. Letter designations shall be A through Y for motor controller Sizes 0, 1, 2, 3, 4, and 5, with 100,000 amperes interrupting capacity rating. Letter designations shall correspond to controller sizes as follows:

CONTROLLER SIZE	MSCP DESIGNATION
NEMA 0	A-N
NEMA 1	A-P
NEMA 2	A-S

## 2.7 CONDUIT

### 2.7.1 Flexible Conduit, Steel and Plastic

General-purpose type, [UL 1](#); liquid tight, [UL 360](#), and [UL 1660](#).

### 2.7.2 PVC Coated Rigid Steel Conduit

[NEMA RN 1](#).

### 2.7.3 Rigid Metal Conduit

UL 6.

### 2.7.4 Surface Metal Electrical Raceways and Fittings

UL 5.

## 2.8 CONDUIT AND DEVICE BOXES AND FITTINGS

### 2.8.1 Boxes, Metallic Outlet

NEMA OS 1 and UL 514C.

### 2.8.2 Boxes, Switch (Enclosed), Surface-Mounted

UL 98.

### 2.8.3 Fittings for Conduit and Outlet Boxes

UL 514B.

## 2.9 CONDUIT COATINGS PLASTIC RESIN SYSTEM

NEMA RN 1, Type A-40.

## 2.10 CONNECTORS, WIRE PRESSURE, FOR USE With Copper Conductors

UL 486A.

## 2.11 ELECTRICAL GROUNDING AND BONDING EQUIPMENT

UL 467.

### 2.11.1 Ground Rods

Ground rods shall be of copper-clad steel conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length of the sectional type driven full length into the earth.

### 2.11.2 Ground Loops and Bus

The ground loops shall be #2/0 AWG bare stranded copper and buried at least 2 feet in the soil. The ground bus shall be a minimum rating of 300 amperes. The ground bus shall mounted in the bottom of the station control center shall be a bare 2/0 AWG copper or flat copper in one piece and mounted, if practicable.

## 2.12 ENCLOSURES

**NEMA ICS 6** and/or **NEMA 250** unless otherwise specified.

### 2.12.1 Cabinets and Boxes

Cabinets and boxes with volume greater than 100 cubic inches shall be in accordance with **UL 50**, hot-dip, zinc-coated, if sheet steel.

### 2.12.2 Circuit Breaker Enclosures

**UL 489**.

## 2.13 FIXTURES, LIGHTING AND FIXTURE ACCESSORIES/COMPONENTS

Standard Drawing 40-06-04 sheets referenced as shown on contract drawing E-4. Fixtures, accessories and components, including ballasts, lampholders, lamps, starters and starter holders, shall conform to industry standards specified below.

### 2.13.1 Fixture, Auxiliary or Emergency

**UL 924**.

### 2.13.2 Fluorescent

- a. Fixture: **NEMA LE 4** for ceiling compatibility of recessed fixtures and **UL 1570**. Fixtures shall be plainly marked for proper lamp and ballast type to identify lamp diameter, wattage, color and start type. Marking shall be readily visible to service personnel, but not visible from normal viewing angles.
- b. Magnetic Ballasts: Magnetic ballast, energy-saving, high power factor, Class P, automatic-resetting Type, approved for the application by the Certified Ballast Manufacturers: **ANSI C82.1** and **UL 935**. Two-lamp ballasts shall be used for each pair of lamps within a fixture or within continuous mounted fixtures. Single-lamp ballasts shall be used for

individually mounted single-lamp fixtures and where an odd single-lamp fixture occurs at the end of a continuous group. Magnetic fluorescent lamp ballasts shall have a Ballast Efficacy Factor (BEF) not less than shown in the following table:

MAGNETIC FLUORESCENT BALLAST EFFICACY FACTORS\*

Design starting temperature above 40 degrees F with 60 Hz input frequency

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NUMBER OF LAMPS	FIXTURE TYPE "B"	NOMINAL OPERATIONAL INPUT VOLTAGE	NOMINAL OPERATIONAL VOLTAGE	MAX. LAMP OPERATING CURRENT	MIN. BALLAST EFFICACY FACTOR
4	4 ft rapid start	120	less than 1000 m amp	1.805	
2	4 ft rapid start	120	less than 1000 m amp	0.900	

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2.13.3 High-Intensity-Discharge

- a. Fixture: [NEMA LE 4](#) for ceiling compatibility of recessed fixtures and [UL 1572](#).
- b. Ballasts: [ANSI C82.4](#) for multiple supply types and [UL 1029](#).

2.14 LOW-VOLTAGE FUSES AND FUSEHOLDERS

2.14.1 Fuses, Low Voltage Cartridge Type

[NEMA FU 1](#).

2.14.2 Fuseholders

[UL 512](#).

2.15 INSTRUMENTS, ELECTRICAL INDICATING

[ANSI C39.1](#).

## 2.16 MOTORS, AC, FRACTIONAL AND INTEGRAL

Motors, ac, fractional and integral horsepower, 5 hp and smaller shall conform to **NEMA MG 1** and **UL 1004** for motors; **NEMA MG 10** for energy management selection of polyphase motors.

### 2.16.1 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.

### 2.16.2 Motor Efficiencies

All permanently wired polyphase motors of 1 hp or more shall meet the minimum full-load efficiencies as indicated in the following table, and as specified in this specification. Motors of 1 hp or more with open, drip proof or totally enclosed fan cooled enclosures shall be high efficiency type, unless otherwise indicated. Motors provided as an integral part of motor driven equipment are excluded from this requirement if a minimum seasonal or overall efficiency requirement is indicated for that equipment by the provisions of another section.

#### Minimum Motor Efficiencies

HP	Std. Efficiency	High Efficiency
1	77.0	85.5
1.5	78.5	85.5
2	78.5	85.5

## 2.17 MOTOR CONTROLS AND MOTOR CONTROL CENTERS

### 2.17.1 General

**NEMA ICS 1**, **NEMA ICS 2**, **NEMA ICS 3** and **NEMA ICS 6**, and **UL 508** and **UL 845**. Panelboards supplying non-linear loads shall have neutrals sized for 200 percent of rated current.

## 2.17.2 Motor Starters

Combination starters shall be provided with circuit breakers and switches equipped with high-interrupting-capacity current-limiting fuses as indicated on the Contract drawings.

## 2.17.3 Thermal-Overload Protection

Each motor of 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.

## 2.17.4 Low-Voltage Motor Overload Relays

### 2.17.4.1 General

Thermal and magnetic current overload relays shall conform to **NEMA ICS 2** and **UL 508**. Overload protection shall be provided either integral with the motor or motor controller, and shall be rated in accordance with the requirements of **NFPA 70**. Standard units shall be used for motor starting times up to 7 seconds. Slow units shall be used for motor starting times from 8 to 12 seconds. Quick trip units shall be used on hermetically sealed, submersible pumps, and similar motors.

### 2.17.4.2 Construction

Manual reset type thermal relay shall be melting alloy and/or bimetallic construction. Automatic reset type thermal relays shall be bimetallic construction. Magnetic current relays shall consist of a contact mechanism and a dash pot mounted on a common frame.

### 2.17.4.3 Ratings

Voltage ratings shall be not less than the applicable circuit voltage. Trip current ratings shall be established by selection of the replaceable overload device and shall not be adjustable. Where the controller is remotely-located or difficult to reach, an automatic reset, non-compensated overload relay shall be provided. Manual reset overload relays shall be provided otherwise, and at all locations where automatic starting is provided. Where the motor is located in a constant ambient temperature, and the thermal device is located in an ambient temperature that regularly varies by more than minus 18 degrees F, an ambient temperature-compensated overload relay shall be provided.

## 2.17.5 Automatic Control Devices

### 2.17.5.1 Direct Control

Automatic control devices (such as thermostats, float or pressure switches) which control the starting and stopping of motors directly shall be designed for that purpose and have an adequate horsepower rating.

#### 2.17.5.2 Pilot-Relay Control

Where the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control device actuating the pilot-control circuit.

#### 2.17.5.3 Manual/Automatic Selection

- a. Where combination manual and automatic control is specified and the automatic-control device operates the motor directly, a double-throw, three-position tumbler or rotary switch (marked MANUAL-OFF-AUTOMATIC) shall be provided for the manual control.
- b. Where combination manual and automatic control is specified and the automatic-control device actuates the pilot control circuit of a magnetic starter, the magnetic starter shall be provided with a three-position selector switch marked MANUAL-OFF-AUTOMATIC.
- c. Connections to the selector switch shall be such that; only the normal automatic regulatory control devices will be bypassed when the switch is in the Manual position; all safety control devices, such as low-or high-pressure cutouts, high-temperature cutouts, and motor-overload protective devices, shall be connected in the motor-control circuit in both the Manual and the Automatic positions of the selector switch. Control circuit connections to any MANUAL-OFF-AUTOMATIC switch or to more than one automatic regulatory control device shall be made in accordance with wiring diagram approved by the Contracting Officer unless such diagram is included on the drawings. All controls shall be 120 volts or less unless otherwise indicated.

#### 2.17.6 Motor Control Centers

Control centers shall conform to the requirements of [NEMA ICS 1](#), [NEMA ICS 2](#), [NEMA ICS 3](#) and [NEMA ICS 6](#), and [UL 508](#) and [UL 845](#). Control centers shall be indoor type and shall contain combination starters and other equipment as indicated. Each control center shall be mounted on floor sills or mounting channels. Each circuit shall have a suitable metal or laminated plastic nameplate with white cut letters. Motor control centers shall be provided with a full-length ground bus bar.

## 2.18 PANELBOARDS

Dead-front construction, [NEMA PB 1](#) and [UL 67](#).

## 2.19 RECEPTACLES

### 2.19.1 Heavy Duty Grade

[NEMA WD 1](#). Devices shall conform to all requirements for heavy duty receptacles.

### 2.19.2 Ground Fault Interrupters

[UL 1010](#).

### 2.19.3 NEMA Standard Receptacle Configurations

[NEMA WD 6](#).

#### a. Single and Duplex, 20-Ampere, 125 Volt

20-ampere, non-locking: NEMA type 5-20R

#### b. 30-Ampere, 125/250 Volt

Three-pole, 3-wire, non-locking: NEMA type 10-30R, locking: NEMA type L10-30R. Three-pole, 4-wire grounding, non-locking:

c. 30-Ampere, 250 Volt, Two-pole, 3-wire grounding, non-locking: NEMA type 6-30R

## 2.20 SERVICE ENTRANCE EQUIPMENT

[UL 869A](#).

## 2.21 SPLICE, CONDUCTOR

[UL 486C](#).

## 2.22 STATION CONTROL CENTER

Assemblies shall be metal-enclosed, freestanding general-purpose type in accordance with [NEMA PB 2](#), [UL 891](#), and [IEEE ANSI/IEEE C37.20.1](#) and shall be installed to provide front and rear access. Busses shall be copper. Assembly shall be approximately 90 inches high; arrangement of circuit breakers and other items specified shall be as indicated. The withstand rating and interrupting capacity of the station control center, panelboard, circuit breakers and other power components shall be based on the maximum fault current available.

### 2.22.1 Circuit Breakers

Circuit breakers shall be stationary molded-case circuit breakers.

### 2.22.2 Auxiliary Equipment

#### Instruments

### 2.22.3 Space Heater

Instruments shall be long scale, 6.8 inches minimum, semiflush rectangular, indicating or digital switchboard type, mounted at eye level.

- a. Ammeter, range 0 to 250 amperes, complete with selector switch having off position and positions to read each line current.
- b. Voltmeter, range 0 to 300 volts, complete with selector switch having off position and positions to read line-to-line and each line to neutral voltage.

### 2.22.4 Control Switch

A control switch with indicating lights shall be provided for each incoming power breaker.

### 2.22.5 Control Power Sources

Control buses and control power transformers shall conform to the requirements of Section [16311](#) MAIN ELECTRIC SUPPLY STATION AND SUBSTATION, where required. Control power shall be 120-volt AC.

## 2.23 SNAP SWITCHES

[UL 20](#).

## 2.24 TAPES

### Plastic Tape

UL 510.

### Rubber Tape

UL 510.

## 2.25 TRANSFORMER

Scott-New Madrid-Mississippi Electric Cooperative, the local power utility, will furnish the single-phase liquid-insulated electrical service transformer. This transformer shall be rated 50kw minimum; however, the Contractor shall furnish the primary loop-circuit for metering plus the entire secondary circuit in underground conduit. The transformer shall comply with IEEE ANSI/IEEE C57.12.00, ANSI C57.12.10, ANSI C57.12.13, ANSI C57.12.27, ANSI C57.12.70, IEEE ANSI/IEEE C57.12.80, IEEE ANSI/IEEE C57.12.90, IEEE ANSI/IEEE C57.98, and IEEE ANSI/IEEE C57.100. Transformers may be the mineral-oil insulated, silicone, or the high-molecular weight hydrocarbon (HMWH) type. Voltage and KVA ratings shall be as indicated. Single kVA ratings shown are based on self-cooled operation. Temperature rise shall not exceed 55 degrees C under full load operation in an ambient temperature of 40 degrees C. Percent voltage impedance shall be manufacturer's standard. The basic impulse insulation level (BIL) rating shall be not less than 95kV for the distribution voltage shown. Nameplates shall be provided in accordance with IEEE ANSI/IEEE C57.12.00.

## 2.26 WATTHOUR METERS

Scott-New Madrid-Mississippi Electric Cooperative will furnish the watthour meter which conforms to ANSI C12.1 and ANSI C12.10; however, the Contractor shall furnish the metering loop-circuit to be installed by the local power utility. The watthour meter will be of the socket-mounted outdoor type meeting ANSI C12.4.

## 2.27 INSTRUMENT TRANSFORMERS

### 2.27.1 General

Instrument transformers shall comply with ANSI C12.11 and IEEE ANSI/IEEE C57.13. Instrument transformers shall be configured for mounting in/on the device to which they are applied. Polarity marks on instrument transformers shall be visually evident and shown on drawings.

### 2.27.2 Current Transformers for Station Control Center

Single-ratio units, used for metering and relaying, shall have a metering accuracy class rating of 200/5. Single-ratio units, used only for relaying, shall have a relaying accuracy class rating of 200/5 for a C classification.

### 2.27.3 Voltage Transformers for the Station Control Center.

Voltage transformers shall have indicated ratios. Units shall have an accuracy class rating of 0.3. Voltage transformers shall be of the drawout type having current-limiting fuses in both primary and secondary circuits. Mechanical interlocks shall prevent removal of fuses, unless the associated voltage transformer is in a drawout position. Voltage transformer compartments shall have hinged doors.

## 2.28 WIRING DEVICES

**NEMA WD 1** for wiring devices, and **NEMA WD 6** for dimensional requirements of wiring devices.

## 2.29 PORTABLE INFRARED HEATER

The Contractor shall supply one portable, weatherproof, infrared heater rated 4,500 watts, 240 volts, single-phase, 60 hertz. The heater housing shall be made of heavy gage aluminum, and shall be mounted on a two wheel, rubber tired cart which is provided with a prop leg to stably support the heater when operating in the vertical position. A sturdy handle for easily moving and steering the vcart shall be permanently attached, and shall be so designed that the cord can be coiled and stored on the handle. The heating element shall be of the metal sheath type with an operating life of 10,000 hours, and shall provide approximately 15,000 BTU' s of radiant heat. A safety screen shall be provided to prevent contact with the heating element. The heater shall be wired with a 3-conductor, No. 10 AWG, type SO flexible cord 30 feet long which is terminated in a 30-ampere, 250 volt, 2-pole, 3-wire, grounding type attachment plug NEMA configuration No. 6-30P. The heater housing shall be grounded through the third conductor. The heater shall be Aitken Model Phx452, or approved equal.

## 2.30 TELEPHONE JACKS

CFR 47 Part 68, plastic shall be class VO in accordance with UL 94.

## 2.31 SMOKE DETECTORS

UL 217 and UL 268

## 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, additional rods not less than 6 feet on centers, or if sectional type rods are used, 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 Ground Bus

Ground bus shall be provided in the electrical equipment rooms as indicated. Noncurrent-carrying metal parts of all electrical equipment shall be effectively grounded by bonding to the ground bus. The ground bus shall be bonded to both the entrance ground, and to a ground rod or rods as specified above having the upper ends terminating approximately 4 inches above the floor. Connections and splices shall be of the brazed, welded, bolted, or pressure-connector type, except that pressure connectors or bolted connections shall be used for connections to removable equipment. Connections shall be bolted type in lieu of thermoweld, so they can be changed as required by additions and/or alterations.

#### 3.1.3 Grounding Conductors

A green equipment grounding conductor, sized in accordance with **NFPA 70** shall be provided, regardless of the type of conduit. Equipment grounding bars shall be provided in the station control center and the panelboard. The equipment grounding conductor shall be carried back to the service entrance grounding connection. All equipment grounding conductors, including station control center conduits and other rigid conduits and metal metallic raceway systems used as such, shall be bonded or joined together in each wiring box or equipment enclosure. Metallic raceways and grounding conductors shall be checked to assure that they are 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

Wiring shall conform to **NFPA 70**, the contract drawings, and the following specifications. Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid zinc-coated steel conduit intermediate metal conduits. Where cables and wires are installed in cable trays, they shall be of the type permitted by **NFPA 70** for use in such applications. Wire fill in conduits shall be based on **NFPA 70** for the type of conduit and wire insulations specified.

### 3.2.1 Conduit Systems

Conduit 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**. Raceways shall be concealed within finished walls, ceilings, and floors unless otherwise shown. Raceways crossing structural expansion joints or seismic joints shall be provided with suitable expansion fittings or other suitable means to compensate for the building expansion and contraction and to provide for continuity of grounding.

#### 3.2.1.1 Pull Wires

A pull wire shall be inserted in each empty raceway in which wiring is to be installed 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 pounds per square inch tensile strength. Not less than 10 inches of slack shall be left at each end of the pull wire.

#### 3.2.1.2 Conduit Stub-Ups

Where conduits are to be stubbed up through concrete floors, a short elbow shall be installed below grade to transition from the horizontal run of conduit to a vertical run. A conduit coupling fitting, threaded on the inside shall be installed, to allow terminating the conduit 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. Empty or spare conduit stub-ups shall be plugged flush with the finished floor with a threaded, recessed plug.

#### 3.2.1.3 Below Slab-on-Grade or in the Ground

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 field wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system.

#### 3.2.1.4 Installing in Slabs Including Slabs on Grade

Conduit installed in slabs-on-grade shall be rigid steel. 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. Where conduit is run parallel to reinforcing steel, the conduit shall be spaced a minimum of one conduit diameter away but not less than one inch from the reinforcing steel.

#### 3.2.1.5 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. Lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment shall be prevented during the course of construction. Clogged raceways shall be cleared of obstructions or shall be replaced.

#### 3.2.1.6 Supports

Metallic conduits and the support system to which they are attached, shall be securely and rigidly fastened in place to prevent vertical and horizontal movement 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, beam clamps, or ceiling trapeze. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structure. Loads shall not be applied to joist bridging. Attachment 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. Cutting the main reinforcing bars in reinforced concrete beams or joists shall be avoided when drilling holes for support anchors. Holes drilled for support anchors, but not used, shall be filled. In partitions of light steel construction, sheet-metal screws may be used. Raceways shall not be supported using wire or nylon ties. Raceways shall be independently supported from the structure. Upper raceways shall not be used as a means of support for lower raceways. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Cables and raceways shall not be supported by ceiling grids.

Except where permitted by **NFPA 70**, wiring shall not be supported by ceiling support systems. Conduits shall be fastened to sheet-metal boxes and cabinets with two locknuts where required by **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.

#### 3.2.1.7 Exposed Raceways

Exposed raceways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Raceways under raised floors and above accessible ceilings shall be considered as exposed installations in accordance with **NFPA 70** definitions.

#### 3.2.1.8 Exposed Risers

Exposed risers shall be supported by U-clamp hangers at intervals not to exceed 10 feet.

#### 3.2.1.9 Communications Raceways

Communications raceways indicated shall be installed in accordance with the previous requirements for conduit and tubing and with the additional requirement that no length of run shall exceed 50 feet for 1/2 inch and 3/4 inch sizes, and 100 feet for 1 inch or larger sizes, and shall not contain more than two 90-degree bends or the equivalent. Additional pull or junction boxes shall be installed to comply with these limitations whether or not indicated. Inside radii of bends in conduits of 1 inch size or larger shall not be less than ten times the nominal diameter.

#### 3.2.2 Busway Systems

Busway systems shall be of the voltage, capacity, and phase characteristics indicated. Vertical runs of busways within 6 feet of the floor shall have solid enclosures. Busways shall be supported at intervals not exceeding 5 feet, and shall be braced properly to prevent lateral movement. Busways penetrating walls or floors shall be provided with flanges to completely close wall or floor openings.

#### 3.2.3 Cables and Conductors

Installation shall conform to the requirements of **NFPA 70**. Covered, bare or insulated conductors of circuits rated over 600 volts shall not occupy the same equipment wiring enclosure, cable, or raceway with conductors of circuits rated 600 volts or less.

##### 3.2.3.1 Sizing

Unless otherwise noted, all sizes are based on copper conductors and the insulation types indicated. Sizes shall be not less than indicated. Branch-circuit conductors shall be not smaller than No. 12 AWG. Conductors for branch circuits of 120 volts more than 100

feet long from panel to load center shall be no smaller than No. 10 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. Class 3 low-energy, remote-control and signal circuits shall be not less than No. 22 AWG.

### 3.2.3.2 Cable Systems

Cable systems shall be installed where indicated. Cables shall be installed concealed behind ceiling or wall finish where practicable. Cables shall be threaded through holes bored on the approximate centerline of wood members; notching of surfaces will not be permitted. Sleeves shall be provided through bond beams of masonry-block walls for threading cables through hollow spaces. Exposed cables shall be installed parallel or at right angles to walls or structural members. In rooms or areas not provided with ceiling or wall finish, cables and outlets shall be installed so that a room finish may be applied in the future without disturbing the cables or resetting the boxes. Exposed nonmetallic-sheathed cables less than 4 feet above floors shall be protected from mechanical injury by installation in conduit or tubing.

### 3.2.3.3 Cable Splicing

Splices shall be made in an accessible location. Crimping tools and dies shall be approved by the connector manufacturer for use with the type of connector and conductor. Copper Conductors, 600 Volt and Under: Splices in conductors No. 10 AWG and smaller diameter shall be made with an insulated, pressure-type connector. Splices in conductors No. 8 AWG and larger diameter shall be made with a solderless connector and insulated with tape or heat-shrink type insulating material equivalent to the conductor insulation.

### 3.2.3.4 Conductor Identification and Tagging

Power, control, and signal circuit conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. 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. Phase conductors of low voltage power circuits shall be identified by color coding. Phase identification by a particular color shall be maintained continuously for the length of a circuit, including junctions.

- a. Color coding shall be provided for service, feeder, branch, and ground conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in the same raceway or box, other neutral shall be white with colored (not green) stripe. The color coding for single-phase low voltage systems shall be 120/240-volt, 1-phase: Black and red.
- b. Control and signal 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 where required by [NFPA 70](#) for pulling of wires, making connections, and mounting of devices or fixtures. Pull boxes shall be furnished with screw-fastened covers. Indicated elevations are approximate, except where minimum mounting heights for hazardous areas are required by [NFPA 70](#). Unless otherwise indicated, boxes for wall switches shall be mounted 48 inches above finished floors. Switch and outlet boxes located on opposite sides of fire rated walls shall be separated by a minimum horizontal distance of 24 inches. The total combined area of all box openings in fire rated walls shall not exceed 100 square inches per 100 square feet. Maximum box areas for individual boxes in fire rated walls vary with the manufacturer and shall not exceed the maximum specified for that box in [UL Elec Const Dir](#). Only boxes listed in [UL Elec Const Dir](#) shall be used in fire rated walls.

#### 3.3.1 Box Applications

Each box shall have not less than the volume required by [NFPA 70](#) for number of conductors enclosed in box. Boxes for metallic raceways, 4 by 4 inch nominal size and smaller, shall be of the cast-metal hub type. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Boxes for mounting lighting fixtures shall be not less than 4 inches square, or octagonal, except smaller boxes may be installed as required by fixture configuration, as approved.

#### 3.3.2 Brackets and Fasteners

Boxes and supports shall be fastened with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel work. The use of brackets which depend on gypsum wallboard or plasterboard for primary support will not be permitted. In partitions of light steel construction, bar hangers with 1 inch long studs, mounted between metal wall studs or metal box mounting brackets shall be used to secure boxes to the building structure. When metal box mounting brackets are used, additional box support shall be provided on the side of the box opposite the brackets. This additional box support shall consist of a minimum 12 inch long section of wall stud, bracketed to the opposite side of the box and secured by two screws through the wallboard on each side of the stud. Metal screws may be used in lieu of the metal box mounting brackets.

#### 3.3.3 Mounting in Walls, Ceilings, or Recessed Locations

In walls or ceilings of concrete, tile, or other non-combustible material, boxes shall be installed so that the edge of the box is not recessed more than 1/4 inch from the finished surface. Boxes mounted in combustible walls or ceiling material shall be mounted flush with the finished surface. The use of gypsum or plasterboard as a means of supporting boxes will not be permitted. Boxes installed for concealed wiring shall be provided with suitable extension rings or plaster covers, as required. The bottom of boxes installed in masonry-block walls for concealed wiring shall be mounted flush with the top of a block to minimize cutting of the blocks, and boxes shall be located horizontally to avoid cutting webs of block. Separate boxes shall be provided for flush or recessed fixtures when required by the fixture terminal operating temperature, and fixtures shall be readily removable for access to the boxes unless ceiling access panels are provided.

#### 3.3.4 Installation in Overhead Spaces

In open overhead spaces, cast-metal boxes threaded to raceways need not be separately supported except where used for fixture support. Hangers shall not be fastened to or supported from joist bridging. Where bar hangers are used, the bar shall be attached to raceways on opposite sides of the box and the raceway shall be supported with an approved type fastener not more than 24 inches from the box.

### 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 zinc-coated sheet steel having rounded or beveled edges. Plates on finished walls shall be of impact-resistant plastic and shall be ivory in color. Screws shall be of metal with countersunk heads, in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed and provided with a hinged, gasketed cover, unless otherwise specified.

### 3.5 RECEPTACLES

#### 3.5.1 Single and Duplex, 20-ampere, 125 volt

Single and duplex receptacles shall be rated 20 amperes, 125 volts, two-pole, three-wire, grounding type with polarized parallel slots. Bodies shall be of ivory to match color of switch handles in the same room or to harmonize with the color of the respective wall, 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. Switched receptacles shall be the same as other receptacles specified except that the ungrounded pole of each suitable receptacle shall be provided with a separate terminal. Only the top receptacle of a duplex receptacle shall be wired for switching application. 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 Clock Outlet

Clock outlet, for use in other than a wired clock system, shall consist of an outlet box, a plaster cover where required, and a single receptacle with clock-outlet plate. The receptacle shall be recessed sufficiently within the box to allow the complete insertion of a standard cap, flush with the plate. A suitable clip or support for hanging the clock shall be secured to the top of the plate. Material and finish of the plate shall be as specified in paragraph DEVICE PLATES.

### 3.5.3 Receptacles, 30-Ampere, 250-Volt

Receptacles, single, 30-ampere, 250-volt, shall be molded-plastic, three-pole, three-wire type, complete with appropriate mating cord-grip plug.

## 3.6 WALL SWITCHES

Wall switches shall be of the totally enclosed tumbler type. The wall switch handle and switch plate color shall be ivory. Wiring terminals shall be of the screw type or of the solderless pressure type having suitable conductor-release arrangement. Not more than two switches shall be installed in a single-gang position. Switches shall be rated 20-ampere 120-volt for use on alternating current only.

## 3.7 STATION CONTROL CENTER

### 3.7.1 Service Disconnecting Means

The service-disconnecting means of the station control center is a couple of interlocking enclosed molded-case circuit breakers which connect commercial or generator power by manual operation. When service disconnecting means is a part of an assembly, the assembly shall be listed as suitable for service entrance equipment. The metal enclosed station control center shall be rated for 240 Volts AC and 300 amperes minimum and 1-phase, 60 Hz and 25,000 symmetrical RMS amperes minimum for short-circuit current.

### 3.7.2 Panelboard

Circuit breakers and switches used as a motor disconnecting means 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. Panelboards shall be circuit breaker equipped as indicated on the contract drawing E2.

Switches serving as a motor disconnect means shall be of the tumbler switch and fuse type. Switches serving as motor disconnect means shall be horsepower rated in conformance with [UL 98](#).

### 3.7.3 Space Heaters

Two space heaters shall be furnished and installed inside the station control center, one on each side near the bottom. The heaters shall be provided with automatic control equipment consisting of a thermostat and magnetic contactor. The thermostat shall be rated at 10 amperes minimum at 120 volts AC, shall be adjustable over the range of 70 degrees to 120 degrees F, shall have a calibrated scale to indicate the set point, and shall be mounted near the top of the station control center. The contactor coil shall be rated 120 volts AC, and contacts shall be rated 20 amperes minimum 120 volts AC. The heaters shall be finned strip type with rust resisting steel sheath, and each heater shall be rated 200 watts, 120 volts a-c.

## 3.8 MOTORS

Each motor shall conform to the horsepower 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. Unless otherwise specified, all motors shall have open frames, and continuous-duty classification based on a 40 degree C ambient temperature reference. 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.

## 3.9 MOTOR CONTROLS

Each motor shall have a separate control circuit located in the station control center as shown on contract drawing E2 or remotely with a suitable controller and/or devices that will perform the functions as specified for the respective motor. Each motor of 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. Automatic control devices such as thermostats, float or pressure switches may control the starting and stopping of motors directly, provided the devices used are designed for that purpose and have an adequate horsepower rating. When the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control

device actuating the pilot-control circuit. When combination manual and automatic control is specified and the automatic-control device operates the motor directly, a double-throw, three-position tumbler or rotary switch shall be provided for the manual control; when the automatic-control device actuates the pilot control circuit of a magnetic starter, the latter shall be provided with a three-position selector switch marked MANUAL-OFF-AUTOMATIC. Connections to the selector switch shall be such that only the normal automatic regulatory control devices will be bypassed when the switch is in the Manual position; all safety control devices, such as low- or high-pressure cutouts, high-temperature cutouts, and motor-overload protective devices, shall be connected in the motor-control circuit in both the Manual and the Automatic positions of the selector switch. Control circuit connections to any MANUAL-OFF-AUTOMATIC switch or to more than one automatic regulatory control device shall be made in accordance with wiring diagram approved by the Contracting Officer unless such diagram is included on the drawings. All controls shall be 120 volts or less unless otherwise indicated.

### 3.10 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.

### 3.11 EQUIPMENT CONNECTIONS

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. Motors, motor controls, and motor control centers shall be installed in accordance with [NFPA 70](#), the manufacturer's recommendations, and as indicated. Wiring shall be extended to motors, motor controls, and motor control centers and terminated.

### 3.12 BATTERY CHARGERS

The battery chargers for the diesel engines shall be rated for 24 volts DC. Battery chargers shall be general purpose, continuous current output, with solid state rectifiers. Means shall be provided to regulate and to adjust the dc output voltage. Chargers shall have continuous current ratings of 10 to 15 percent higher than battery current outputs based upon an 8-hour discharge.

### 3.13 PORTABLE INFRARED HEATER

The Contractor shall supply one portable, weatherproof, infrared heater rated 4,500 watts, 240 volts, single-phase, 60 hertz. The heater housing shall be made of heavy gage aluminum, and shall be mounted on a two wheel, rubber tired cart which is provided with a prop leg to stably support the heater when operating in the vertical position. A sturdy handle for easily moving and steering the vcart shall be permanently attached, and shall be so designed that the cord can be coiled and stored on the handle. The heating element shall be of the metal sheath type with an operating life of 10,000 hours, and shall provide approximately 15,000 BTU's of radiant heat. A safety screen shall be provided to prevent contact with the heating element. The heater shall be wired with a 3-conductor, No. 10 AWG, type SO flexible cord 30 feet long which is terminated in a 30-ampere, 250 volt, 2-pole, 3-wire, grounding type attachment plug NEMA configuration No. 6-30P. The heater housing shall be grounded through the third conductor. The heater shall be Aitken Model Phx452, or approved equal.

### 3.14 FUSES

Equipment provided under this contract shall be provided with a complete set of properly rated fuses when the equipment manufacturer utilize fuses in the manufacture of the equipment, or if current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed. Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage, and shall have the time-current characteristics required for effective power system coordination. Time-delay and non-time-delay options shall be as [shown] [specified].

#### 3.14.1 Cartridge Fuses; Current-Limiting Type

Cartridge fuses, current-limiting type, Class G, J, K and L shall have tested interrupting capacity not less than 25,000 amperes RMS symmetrical. Fuse holders shall be the type that will reject all Class H fuses.

#### 3.14.2 Continuous Current Ratings (600 Amperes and Smaller)

Service entrance and feeder circuit fuses (600 amperes and smaller) shall be Class , current-limiting, time-delay with 25,000 amperes interrupting capacity.

#### 3.14.3 Motor and Transformer Circuit Fuses

Motor, motor controller, transformer, and inductive circuit fuses shall be Class RK1 or RK5, current-limiting, time-delay with 25,000 amperes interrupting capacity.

### 3.15 CONTROL CENTERS

Control centers shall be indoor type and shall contain combination starters and other equipment as indicated. Control centers shall be **NEMA ICS 2**, Class II, Type C. Each control center shall be mounted on floor sills or mounting channels. Each circuit shall have a suitable metal or laminated plastic nameplate with white cut letters. Combination starters shall be provided with circuit breakers. Motor control centers shall be provided with a full-length ground bus bar.

#### 3.15.1 Contacts

Unless otherwise indicated, 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.

#### 3.15.2 Safety Controls

Safety controls for boilers shall be connected to a 2-wire, 120 volt grounded circuit supplied from the associated boiler-equipment circuit. Where the boiler circuit is more than 120 volts to ground, safety controls shall be energized through a two-winding transformer having its 120 volt secondary winding grounded. Overcurrent protection shall be provided in the ungrounded secondary conductor and shall be sized for the load encountered.

### 3.16 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.

#### 3.16.1 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.

##### 3.16.1.1 Fluorescent

Fluorescent lamps for magnetic ballasts shall be as indicated and shall be of a type that will not require starter switches. Lamps shall be of the rapid-start type unless otherwise shown or approved. Fluorescent lamps for electronic ballasts shall be as indicated.

##### 3.16.1.2 High-Intensity-Discharge

High-intensity-discharge lamps shall be the high-pressure sodium type unless otherwise indicated, shown, or approved.

### 3.16.2 Fixtures

Fixtures shall be as shown on contract drawing E4 and shall conform to Standard Drawing No. 40-06-04 for the types indicated. Illustrations shown on contract drawing E4 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. In suspended acoustical ceilings with fluorescent fixtures, the fluorescent emergency light fixtures shall be furnished with self-contained battery packs.

#### 3.16.2.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation. Open type fluorescent fixtures with exposed lamps shall have a wire-basket type guard.

#### 3.16.2.2 Suspended Fixtures

Suspended fixtures shall be provided with swivel hangers in order to ensure a plumb installation. Pendants, rods, or chains 4 feet or longer excluding fixture, shall be braced to limit swinging. Bracing shall be 3 directional, 120 degrees apart. Single unit suspended fluorescent fixtures shall have twin-stem hangers. Multiple unit or continuous-row fluorescent units shall have a tubing or stem for wiring at one point, and a tubing or rod suspension provided for each length of chassis including one at each end. Maximum distance between adjacent tubing or stems shall be 10 feet. Rods shall be of not less than 3/16 inch diameter. Flexible raceway shall be installed to each fixture from an overhead junction box. Fixture to fixture wiring installation is allowed only when fixtures are installed end to end in a continuous run.

#### 3.16.2.3 Ceiling Fixtures

Ceiling fixtures shall be coordinated with and suitable for installation in, on, or from the suspended ceiling provided under other sections of these specifications. Installation and support of fixtures shall be in accordance with the [NFPA 70](#) and manufacturer's recommendations. Recessed fixtures shall have adjustable fittings to permit alignment with ceiling panels. Recessed fixtures installed in fire-resistive type of suspended ceiling construction shall have the same fire rating as the ceiling or shall be provided with fireproofing boxes having materials of the same fire rating as the ceiling panels, in conformance with [UL Elec Const Dir](#). Surface-mounted fixtures shall be suitable for fastening to the structural support for ceiling panels.

### 3.16.3 Emergency Light Sets

Emergency light sets shall conform to **UL 924** with the number of heads as indicated. Sets shall be permanently connected to the wiring system by conductors installed in short lengths of flexible conduit.

### 3.17 TELEPHONE WIRING SYSTEM

The telephone wiring system shall be complete and functional.

#### 3.17.1 Telephone Cables

Each telephone outlet shall be 24-gage solid copper station-type color coded cable, vinyl insulated with an overall vinyl jacket. Cable shall be continuous from each telephone outlet to service entrance/protector as indicated on the drawings. Splicing of individual cables shall not be permitted. At each outlet, four-pair cable shall be terminated on the modular jack assembly, using color code provided by the Contracting Officer.

#### 3.17.2 Telephone Outlets

Modular telephone outlets shall comply with FCC Rules and Regulations, Part 68, Subpart F. Each modular outlet shall have a single modular jacks. Each eight-position jack in the modular outlet shall contain screw terminals or approved quick connect terminals for each conductor in the cable. The flush mounted cover shall be ivory. Each outlet shall be numbered for easy identification of type and location.

#### 3.17.3 Auxiliary Devices

All auxiliary devices such as tie bars, cable rings, etc. which are not shown but required for a high grade installation shall be provided.

#### 3.17.4 Qualifications of Installer

The system shall be installed by an experienced installer regularly engaged in the installation of telephone systems. The Contracting Officer may reject any proposed installer who can not show evidence of such qualifications.

### 3.18 SMOKE DETECTORS

The smoke detectors shall be photoelectric type and shall be energized by 120 volts AC, 60 HZ electrical power from a designated breaker from the station control center power panelboard as shown on the drawing.

#### 3.18.1 Operate on Light

The smoke detectors shall operate on a light scattering concept using an LED light source. Failure of the LED shall not cause an alarm condition. Detectors shall be factory set for sensitivity and shall require no field adjustments of any kind. Detectors shall have a sensitivity between 1.9 and 2.4 percent per foot smoke obscurations using the UL 217/268 Test Box.

#### 3.18.2 Self-Restoring

The smoke detectors shall be self-restoring type which do not require any readjustment after actuation to restore it to normal operation. Detectors shall be UL listed as Smoke-Automatic Fire Detectors. Install detectors in accordance with the requirements described in the listing.

#### 3.18.3 Twist Lock Base

The smoke detector shall have a twist lock base with encapsulated electronic circuitry. It shall neither utilize nor require springs to maintain contact between the detector and its base. Provide companion mounting base with fixed wiring terminals. The field wiring shall terminate on fixed terminals.

#### 3.18.4 Not Sensitive to Changes in Humidity

The smoke detector shall not be sensitive to changes in humidity. All components shall be rust and corrosion resistant. Vibration shall have no effect on the detector's operation. Protect the detection chamber with a fine mesh metallic screen which prevents the entrance of insect or air born materials. The screen shall not inhibit the movement of smoke particles into the chamber.

#### 3.18.5 Visual Indicator

Each smoke detector shall have a visual indicator to show the detector has operated. Detectors shall have a factory serial number or other permanently attached designation to identify the particular detector and its sensitivity setting.

### 3.19 CIRCUIT PROTECTIVE DEVICES

The Contractor shall calibrate, adjust, set and test each new adjustable circuit protective device to ensure that they will function properly prior to the initial energization of the new power system under actual operating conditions.

### 3.20 PAINTING AND FINISHING

Field-applied paint on exposed surfaces shall be provided under Section 09900 PAINTING, GENERAL.

### 3.21 FIELD TESTING

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 3 days 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 inspection 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 will be signed and dated by the Contractor.

#### 3.21.1 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.

#### 3.21.2 Ground-Resistance Tests

The resistance of the grounding electrode system shall be measured using the fall-of-potential method defined in [IEEE Std 81](#). Soil resistivity in the area of the grid shall be measured concurrently with the grid measurements. 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.

3.21.2.1 Single rod electrode - 25 ohms.

3.21.2.2 Grid electrode - 5 ohms.

#### 3.21.3 Ground-Grid Connection Inspection

All below-grade ground-grid connections will be visually inspected by the Contracting Officer before backfilling. The Contractor shall notify the Contracting Officer 8 hours before the site is ready for inspection.

#### 3.21.4 Cable Tests

The Contractor shall be responsible for identifying all equipment and devices that could be damaged by application of the test voltage and ensuring that they have been properly disconnected prior to performing insulation resistance testing. An insulation resistance test shall be performed on all low and medium voltage cables after the cables are installed in their final configuration 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 of conductors. The minimum value of resistance shall be:  $R$  in megohms = (rated voltage in kV + 1) x 1000/(length of cable in feet)

Each cable failing this test shall be repaired or replaced. The repaired cable system shall then be retested until failures have been eliminated.

#### 3.21.4.1 Low Voltage Cable Tests

- a. Continuity test.
- b. Insulation resistance test.

#### 3.21.4.2 Motor Tests

- a. Phase rotation test to ensure proper directions.
- b. Operation and sequence of reduced voltage starters.
- c. High potential test on each winding to ground.
- d. Insulation resistance of each winding to ground.

#### 3.21.5 Circuit Breaker Tests

The following field tests shall be performed on circuit breakers.

##### 3.21.5.1 Circuit Breakers, Molded Case

- a. Insulation resistance test phase-to-ground, each phase.
- b. Closed breaker contact resistance test.
- c. Manual operation of the breaker.

##### 3.21.5.2 Motor Control Centers

- a. Insulation resistance test phase-to-ground, each phase.
- b. Manual and electrical operational tests.

### 3.22 UNDERGROUND SERVICE

Unless otherwise indicated, interior conduit systems shall be stubbed out 5 feet beyond the building wall and 2 feet below finished grade, for interface with the exterior service lateral conduits and exterior communications conduits. Outside conduit ends shall be bushed when used for direct burial service lateral conductors. Outside conduit ends shall be capped or plugged until connected to exterior conduit systems. Underground service lateral conductors will be extended to building service entrance and terminated in accordance with the requirements of **NFPA 70**.

### 3.23 OPERATING TESTS

After the installation is completed, and at such time 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 specified requirements. An operating test report shall be submitted in accordance with paragraph **FIELD TEST REPORTS**.

### 3.24 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 4 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, 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. The Contractor shall instruct personnel as to the operational and maintenance features of the equipment.

### 3.25 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--