AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE	OF	PAGES
	1		3

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. *(If applicable)*
0003	2 SEPT 2003		

6. ISSUED BY CODE

US ARMY ENGINEER DISTRICT, FORT WORTH
ATTN: CESWF-CT (RM 2A19)
PO BOX 17300
FORT WORTH, TX 76102-0300

7. ADMINISTERED BY *(If other than Item 6)* CODE

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)*

CODE FACILITY CODE

(X)

☒ 9A. AMENDMENT OF SOLICIATION NO.: DACA63-03-B-0008

9B. DATED *(SEE ITEM 11)*: 11 AUGUST 2003

☐ 10A. MODIFICATION OF CONTRACT/ORDER NO.

10B. DATED *(SEE ITEM 11)*

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☒ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☒ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a)By completing items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE	
	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation date, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER *(Specify type of modification and authority)*

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (*Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

The Solicitation for Water System Upgrade, Fort Bliss, Texas, is amended as follows:

See Continuation Sheet:

NOTE: The bid opening date and time is "12 September 2003 at 2 p.m. local time", as previous announced.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER *(Type or print)*		16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)*	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign)		*(Signature of Contracting Officer)*	

Item 14. Continued.

CHANGES TO BIDDING SCHEDULE

1. Replace the Bidding Schedule, with the accompanying new Bidding Schedule, bearing the notation "ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-B-0008."

CHANGES TO THE SPECIFICATIONS:

2. Replacement Sections: Replace the following sections with the accompanying new sections of the same number and title, bearing the notation "ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-B-0008:"

01270A	MEASUREMENT AND PAYMENT
02220	DEMOLITION
02316	EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS
02510A	WATER DISTRIBUTION SYSTEM
02741A	HOT-MIX ASPHALT (HMA) FOR ROADS
11241A	CHLORINE-FEEDING MACHINES (SEMIAUTOMATIC)
13110	CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)
13112	SPECIALTY PRODUCTS

3. Added Forms and Attachments - Add the following accompanying forms and attachments.

SOIL STRATIGRAPHY
Insert this attachment behind the SOILS AND FOUNDATION REPORT.

4. Deleted Sections:

02317	ENCASEMENT PIPE - JACK AND BORE METHOD

CHANGES TO THE DRAWINGS:

5. Delete encasement pipe from all Areas of Work. All pavement crossings will be by open cut method. Pavement repairs are per bid schedule in Work Area A and are base bid items in all other Work Areas. Reference Sequence No. 007; Drawing CW-105, Area A: Add General Note #8: "The railroad crossings shown will be open cut. Contractor shall remove and place existing rail, ties, and ballast to original condition."

6. Reference Sequence No. 010; Drawing CW-108, Area A; Reference Note located at area 2-E on the plan: "Existing lines in this area are on the surface indicating rock. See bid schedule for rock removal." Add the following to this Note: "Rock removal shall be as directed by the Contracting Officer. Existing above ground piping shall be replaced above ground as follows: Provide 8 inch bedding minimum above rock surface, install ductile iron pipe with restrained joints (mechanical joints with retainer glands or approved equal), provide 3 foot minimum fill cover over pipe with 5:1 minimum slope back to natural ground, provide 2 inch thickness of gravel mulch over exposed earth resulting from Contractor's operations this area. See bid schedule for Ductile Iron Pipe Above Ground."

7. Reference Sequence No. 034, Drawing E-101: Delete last sentence from Keyed Note #3. Add the following sentence to Keyed Note #3: "Provide 4 inch minimum concrete cover around ducts and 4 inch clearance between ducts."

8. Reference Sequence No. 037; Drawing C-101, Area C: Delete Note #5.

9. Reference Sequence No. 065, Drawing E-101: Delete all references to Detail 2/E101 - E101. Add the following sentence to Keyed Note #1: "Provide 4 inch minimum concrete cover around ducts and 4 inch clearance between ducts."

10. Reference Sequence No. 067; Drawing C-101, Area E: Add General Note #1 as follows: "Existing elevated water storage tank shall be repainted both inside and outside."

11. Reference Sequence No. 146; Drawing C-102: Add Contractor's Note #2: "The Contractor is advised that grading and excavation work for installation of the new tank and access road is in rock. Excavation is unclassified and no additional payment will be made for rock removal. Wasting of excess excavation will be allowed on site at the direction of the Contracting Officer."

12. In all Work Areas: Contractor shall provide cathodic protection of buried ferrous materials in accordance with Section 13110 CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE). Contractor shall provide cathodic protection of new steel tanks in accordance with Section 13111A CATHODIC PROTECTION SYSTEM (STEEL WATER TANKS).

13. Replacement Drawings.- Replace the drawing listed below with the attached new drawing of the same number, bearing the notation "AM #0003":

cover.cal G-000 Seq 1 COVERSHEET

14. Deleted Drawings:

Sequence No.	Sheet No.	Title
041	C-104	AREA C – ENLARGED SITE PLAN
057	C-104	AREA D – ENLARGED SITE PLAN
074	C-102	AREA F – EROSION CONTROL PLAN
079	C-107	AREA F – CHLORINE BUILDING
080	C-108	AREA F – ENLARGED SITE PLAN
086	C-506	AREA F – CHLORINE DETAILS
133	C-102	AREA J – EROSION CONTROL PLAN
134	C-103	AREA J – ENLARGED SITE PLAN
149	C-105	AREA K – ENLARGED SITE PLAN
176	G-001	AREA N – SITE MAP/INDEX

END OF AMENDMENT

Upgrade Water System (Title)
Fort Bliss, Texas (Location)

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE
(To be attached to SF 1442)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
BASE BID: All work required by the plans and specifications for the Upgrade Water System excluding all Option Bid Items.					
0001	WATER LINES IN NON-PAVED AREAS (AREA A)				
0001AA	1-Inch Pipe	50	LF	$_____	$_____
0001AB	2-Inch Pipe	367	LF	$_____	$_____
0001AC	3-Inch Pipe	495	LF	$_____	$_____
0001AD	4-Inch Pipe	891	LF	$_____	$_____
0001AE	6-Inch Pipe	12,600	LF	$_____	$_____
0001AF	8-Inch Pipe	11,000	LF	$_____	$_____
0001AG	10-Inch Pipe	554	LF	$_____	$_____
0001AH	12-Inch Pipe	3,500	LF	$_____	$_____
0001AI	14-Inch Pipe	50	LF	$_____	$_____
0001AJ	16-Inch Pipe	7,700	LF	$_____	$_____
				Total Bid Item No. 1	$_____
0002	WATER LINES IN PAVED AREAS(AREA A)				
0002AA	1-Inch Pipe	50	LF	$_____	$_____
0002AB	2-Inch Pipe	100	LF	$_____	$_____
0002AC	3-Inch Pipe	100	LF	$_____	$_____
0002AD	4-Inch Pipe	100	LF	$_____	$_____
0002AE	6-Inch Pipe	2,400	LF	$_____	$_____
0002AF	8-Inch Pipe	1,600	LF	$_____	$_____
0002AG	12-Inch Pipe	3,400	LF	$_____	$_____
0002AH	14-Inch Pipe	50	LF	$_____	$_____
0002AI	16-Inch Pipe	7,100	LF	$_____	$_____
				Total Bid Item No. 2	$_____

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
[AM#3] 0003	**DELETED**				
[AM#3] 0004	**DELETED**				
0005	FIRE HYDRANTS (AREA A)	150	EA	$_____	$_____
[AM#3] 0006	PIPE BOLLARDS (AREA A)	**600**	EA	$_____	$_____
0007	GATE VALVES (AREA A)				
0007AA	2-Inch	5	EA	$_____	$_____
0007AB	4-Inch	6	EA	$_____	$_____
0007AC	6-Inch	220	EA	$_____	$_____
0007AD	8-Inch	44	EA	$_____	$_____
0007AE	10-Inch	12	EA	$_____	$_____
0007AF	12-Inch	13	EA	$_____	$_____
0007AG	14-Inch	3	EA	$_____	$_____
0007AH	16-Inch	35	EA	$_____	$_____

Total Bid Item No. 7 $_____

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
0008	REDUCERS (AREA A)				
0008AA	1 or 1-1/2 X 2	2	EA	$_____	$_____
0008AB	2 X 4	3	EA	$_____	$_____
0008AC	3 X 4	1	EA	$_____	$_____
0008AD	4 X 6	3	EA	$_____	$_____
0008AE	4 X 8	2	EA	$_____	$_____
0008AF	4 X 10	1	EA	$_____	$_____
0008AG	4 X 12	1	EA	$_____	$_____
0008AH	4 X 14	1	EA	$_____	$_____
0008AI	4 X 16	1	EA	$_____	$_____
0008AJ	6 X 8	3	EA	$_____	$_____
0008AK	6 X 10	3	EA	$_____	$_____
0008AL	6 X 12	2	EA	$_____	$_____
0008AM	6 X 14	1	EA	$_____	$_____
0008AN	6 X 16	1	EA	$_____	$_____
0008AP	8 X 10	1	EA	$_____	$_____
0008AQ	8 X 12	4	EA	$_____	$_____
0008AR	8 X 14	1	EA	$_____	$_____
0008AS	8 X 16	2	EA	$_____	$_____
0008AT	10 X 12	1	EA	$_____	$_____
0008AU	10 X 14	1	EA	$_____	$_____
0008AV	10 X 16	1	EA	$_____	$_____
0008AW	12 X 14	1	EA	$_____	$_____
0008AX	12 X 16	4	EA	$_____	$_____

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
0008AY	14 X 16	2	EA	$_____	$_____
			Total Bid Item No. 8		$_____
0009	TEES (AREA A)				
0009AA	4-Inch	2	EA	$_____	$_____
0009AB	6-Inch	26	EA	$_____	$_____
0009AC	8-Inch	15	EA	$_____	$_____
0009AD	10-Inch	2	EA	$_____	$_____
0009AE	12-Inch	11	EA	$_____	$_____
0009AF	14-Inch	1	EA	$_____	$_____
0009AG	16-Inch	19	EA	$_____	$_____
			Total Bid Item No. 9		$_____
0010	90 DEGREE BENDS (AREA A)				
0010AA	4-Inch	3	EA	$_____	$_____
0010AB	6-Inch	12	EA	$_____	$_____
0010AC	8-Inch	19	EA	$_____	$_____
0010AD	10-Inch	5	EA	$_____	$_____
0010AE	12-Inch	8	EA	$_____	$_____
0010AF	16-Inch	7	EA	$_____	$_____
			Total Bid Item No. 10		$_____

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
0011	45 DEGREE BENDS (AREA A)				
0011AA	4-Inch	8	EA	$_____	$_____
0011AB	6-Inch	12	EA	$_____	$_____
0011AC	8-Inch	16	EA	$_____	$_____
0011AD	10-Inch	7	EA	$_____	$_____
0011AE	12-Inch	11	EA	$_____	$_____
0011AF	16-Inch	18	EA	$_____	$_____
				Total Bid Item No. 11	$_____
0012	22-1/2 DEGREE BENDS (AREA A)				
0012AA	4-Inch	2	EA	$_____	$_____
0012AB	6-Inch	6	EA	$_____	$_____
0012AC	8-Inch	10	EA	$_____	$_____
0012AD	10-Inch	1	EA	$_____	$_____
0012AE	12-Inch	5	EA	$_____	$_____
0012AF	16-Inch	7	EA	$_____	$_____
				Total Bid Item No. 12	$_____

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
0013	11-1/4 DEGREE BENDS (AREA A)				
0013AA	4-Inch	1	EA	$_____	$_____
0013AB	6-Inch	1	EA	$_____	$_____
0013AC	8-Inch	1	EA	$_____	$_____
0013AD	10-Inch	1	EA	$_____	$_____
0013AE	12-Inch	3	EA	$_____	$_____
0013AF	16-Inch	3	EA	$_____	$_____
			Total Bid Item No. 13		$_____
0014	SOLID SLEEVES (AREA A)				
0014AA	4-Inch	2	EA	$_____	$_____
0014AB	6-Inch	6	EA	$_____	$_____
0014AC	8-Inch	20	EA	$_____	$_____
0014AD	10-Inch	1	EA	$_____	$_____
0014AE	12-Inch	8	EA	$_____	$_____
0014AF	14-Inch	1	EA	$_____	$_____
0014AG	16-Inch	4	EA	$_____	$_____
			Total Bid Item No. 14		$_____
0015	TAPPING SLEEVE AND VALVE WITH VALVE BOX (AREA A)				
0015AA	4 X 4	1	EA	$_____	$_____
0015AB	6 X 6	5	EA	$_____	$_____
0015AC	6 X 8	12	EA	$_____	$_____
0015AD	6 X 10	10	EA	$_____	$_____
0015AE	6 X 12	20	EA	$_____	$_____

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
0015AF	6 X 14	10	EA	$_____	$_____
0015AG	6 X 16	5	EA	$_____	$_____
0015AH	8 X 8	20	EA	$_____	$_____
0015AI	8 X 10	15	EA	$_____	$_____
0015AJ	8 X 12	26	EA	$_____	$_____
0015AK	8 X 14	1	EA	$_____	$_____
0015AL	8 X 16	5	EA	$_____	$_____
0015AM	10 X 10	9	EA	$_____	$_____
0015AN	12 X 12	10	EA	$_____	$_____
0015AO	12 X 14	1	EA	$_____	$_____
0015AP	12 X 15	10	EA	$_____	$_____
			Total Bid Item No. 15		$_____
0016	CUT AND CAP (AREA A)				
0016AA	4-Inch	2	EA	$_____	$_____
0016AB	6-Inch	18	EA	$_____	$_____
0016AC	8-Inch	12	EA	$_____	$_____
0016AD	10-Inch	15	EA	$_____	$_____
0016AE	12-Inch	12	EA	$_____	$_____
0016AF	14-Inch	3	EA	$_____	$_____
0016AG	16-Inch	8	EA	$_____	$_____
			Total Bid Item No. 16		$_____

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
0017	REMOVE EXISTING PIPING (NOT ASBESTOS CEMENT) IN NON-PAVED AREAS (AREA A)				
0017AA	4-Inch	200	LF	$_____	$_____
0017AB	6-Inch	3,000	LF	$_____	$_____
0017AC	8-Inch	4,000	LF	$_____	$_____
0017AD	10-Inch	300	LF	$_____	$_____
0017AE	12-Inch	300	LF	$_____	$_____
0017AF	14-Inch	3,000	LF	$_____	$_____
0017AG	16-Inch	300	LF	$_____	$_____
				Total Bid Item No. 17	$_____
0018	REMOVE EXISTING PIPING (NOT ASBESTOS CEMENT) IN PAVED AREAS (AREA A)				
0018AA	4-Inch	176	LF	$_____	$_____
0018AB	6-Inch	1,732	LF	$_____	$_____
0018AC	8-Inch	2,000	LF	$_____	$_____
0018AD	10-Inch	200	LF	$_____	$_____
0018AE	12-Inch	200	LF	$_____	$_____
0018AF	14-Inch	4,000	LF	$_____	$_____
0018AG	16-Inch	4,000	LF	$_____	$_____
				Total Bid Item No. 18	$_____
0019	REMOVE EXISTING ASBESTOS CEMENT PIPING IN NON-PAVED AREAS (AREA A)				
0019AA	4-Inch	400	LF	$_____	$_____
0019AB	6-Inch	4,000	LF	$_____	$_____
0019AC	8-Inch	4,000	LF	$_____	$_____
0019AD	10-Inch	1,500	LF	$_____	$_____
0019AE	12-Inch	400	LF	$_____	$_____

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
0019AF	14-Inch	200	LF	$_____	$_____
0019AG	16-Inch	100	LF	$_____	$_____
			Total Bid Item No. 19		$_____
0020	REMOVE EXISTING ASBESTOS CEMENT PIPING IN PAVED AREAS (AREA A)				
0020AA	4-Inch	100	LF	$_____	$_____
0020AB	6-Inch	500	LF	$_____	$_____
0020AC	8-Inch	500	LF	$_____	$_____
0020AD	10-Inch	500	LF	$_____	$_____
0020AE	12-Inch	100	LF	$_____	$_____
0020AF	14-Inch	100	LF	$_____	$_____
0020AG	16-Inch	100	LF	$_____	$_____
			Total Bid Item No. 20		$_____
[AM#3] 0021	FLOWABLE BACKFILL (AREA A)	**9,000**	SY	$_____	$_____
0022	AGGREGATE SURFACE COURSE (AREA A)	2,000	SY	$_____	$_____
0023	CONCRETE WALK REPLACEMENT (AREA A)	5,000	SF	$_____	$_____
0024	CONCRETE PAVEMENT REPLACEMENT (AREA A)	300	SY	$_____	$_____
[AM#3] 0025	ASPHALT PAVEMENT REPLACEMENT (AREA A)	**7,400**	SY	$_____	$_____
[AM#3] 0026	CURB AND GUTTER REPLACEMENT (AREA A)	**6,200**	LF	$_____	$_____
0027	CONCRETE ENCASE WATER LINE (AREA A)	180	LF	$_____	$_____
0028	2-INCH BLOW-OFF (AREA A)	12	EA	$_____	$_____
0029	2-INCH METER IN METER BOX (AREA A)	5	EA	$_____	$_____

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
0030	1-INCH METER IN METER BOX (AREA A)	10	EA	$_____	$_____
0031	1-INCH MANUAL AIR RELEASE VALVE (AREA A)	20	EA	$_____	$_____
[AM#3] **0032**	**MOUNT FRANKLIN RED LANDSCAPE ROCK W/ WOVEN WEED BARRIER UNDERLAYMENT (AREA A)**	**1,000**	**TON**	**$_____**	**$_____**
0033	COUPLINGS FOR TIE-INS (AREA A)				
0033AA	1-Inch	10	EA	$_____	$_____
0033AB	2-Inch	5	EA	$_____	$_____
0033AC	3-Inch	2	EA	$_____	$_____
				Total Bid Item No. 33	$_____
[AM#3] 0034	TRENCH ROCK EXCAVATION **(AREA A)**	**500**	CY	$_____	$_____
[AM#3] **0035**	**DUCTILE IRON PIPE ABOVE GROUND (AREA A)**	**1,200**	**LF**	**$_____**	**$_____**
(Am#3)0036	**ALL WORK FOR AREAS B THRU G**				
0036AA	**AREA B - BUILDING 1318 PUMP REPLACEMENTS/RESERVOIR DEMOLITION AND REPLACEMENT**	**JOB**	**SUM**	***	**$_____**
0036AB	**AREA C - BUILDING 11172 AND 11173 RESERVOIR DEMOLITION AND REPLACEMENT**	**JOB**	**SUM**	***	**$_____**
0036AC	**AREA D - BUILDING 4317 RESERVOIR DEMOLITION AND REPLACEMENT**	**JOB**	**SUM**	***	**$_____**
0036AD	**AREA E - HUECO WELL TANK PAINTING/ENGINE REPLACEMENT**	**JOB**	**SUM**	***	**$_____**
0036AE	**AREA F - BUILDING 3695 PUMP AND ENGINE DRIVE REPLACEMENTS AND MANIFOLD IMPROVEMENTS**	**JOB**	**SUM**	***	**$_____**

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
0036AF	**AREA G - ELECTRICAL SCADA AND INSTRUMENTATION**	**JOB**	**SUM**	***	**$_____**
0036AG	**ALL WORK NOT SEPARATELY LISTED**	**JOB**	**SUM**	***	**$_____**
				TOTAL BID ITEM 0036	**$_____**
0037	Warranty Work (All Contract Work) The monetary value of this bid item shall equal at least 1 per cent of the total of all bid items preceding it. A value less than 1 per cent will result in a determination of non-responsive bid. See Contract Specification Section 01770 CONTRACT CLOSEOUT, paragraph “Contractor’s Response to Construction Warranty Service Requirements.”	JOB	SUM	***	$_____
0038	Operation & Maintenance Manuals	JOB	SUM	***	$ 25,000.00
0039	Final As-Built Drawings	JOB	SUM	***	$ 25,000.00

TOTAL BASE BID $_____

0040 OPTION NO. 1: Additional cost for all work required by the plans and specifications for: Area H - Building 4318 Pump Replacement.

TOTAL OPTION NO. 1 $_____

0041 OPTION NO. 2: Additional cost for all work required by the plans and specifications for: Area I - McGregor Range Camp Water Line Improvements.

TOTAL OPTION NO. 2 $_____

0042 OPTION NO. 3: Additional cost for all work required by the plans and specifications for: Area J - Dona Ana Range Camp Water Storage and Water Line Improvements.

TOTAL OPTION NO. 3 $_____

0043 OPTION NO. 4: Additional cost for all work required by the plans and specifications for: Area K - Oro Grande Range Camp Water Storage and Water Line Improvements.

TOTAL OPTION NO. 4 $_____

0044 OPTION NO. 5: Additional cost for all work required by the plans and specifications for: Area L - Pump Capacity, Tobin Well Building 3695.

TOTAL OPTION NO. 5 $_____

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
0045	OPTION NO. 6: Additional cost for all work required by the plans and specifications for: Area M - Pump Capacity, Main Cantonment Building 1318.				

TOTAL OPTION NO. 6 $_____

TOTAL BASE BID + OPTIONS 1 - 6: $_____

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

NOTES:

1. ARITHMETIC DISCREPANCIES (EFARS 14.407-2)

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

(1) Obviously misplaced decimal points will be corrected;

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

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

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

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

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

2. If a modification to a bid based on unit prices is submitted, which provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price in the bid schedule must be stated. 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.

3. Bidders must bid on all items.

4. Costs attributable to Division 01 - General Requirements are assumed to be prorated among bid items listed.

5. Responders are advised that this requirement may be delayed, cancelled or revised at any time during the solicitation, selection, evaluation, negotiation and/or final award process based on decisions related to DOD changes in force structure and disposition of the Armed Forces.

6. For the purpose of this solicitation, the word "item" shall be considered to mean "schedule" as used in Provision 52.214-0019, CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION, in Section 00100 INSTRUCTIONS, CONDITIONS, AND NOTICES TO BIDDERS.

Solicitation No. DACA63-03-B-0008

BIDDING SCHEDULE(cont)

NOTES (cont)

(Am#2) 7. Payment items for the work of this Contract for which 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 all direct and indirect costs, including all labor, materials, equipment, tools, incidentals, and markups necessary to complete the work.

8. EXERCISE OF OPTIONS (SWDR 715-1-1 (16 January 1996))

The Government reserves the right to exercise the option(s) by written notice to the Contractor either singularly or in any combination for up to 90 calendar days after award of the Base Bid without an increase in the Offeror's Bid Price. Completion of added items shall continue at the same schedule as the Base Bid unless otherwise noted in Section 01000 CONSTRUCTION SCHEDULE, paragraph 1 entitled SCHEDULE.

9. ABBREVIATIONS

For the purpose of this solicitation, the units of measure are represented as follows:

a. EA (each)
b. SY (square yards)
c. SF (square feet)
d. LS (lump sum)
e. LF (length in linear feet)

END OF BIDDING SCHEDULE

SECTION 01270A

MEASUREMENT AND PAYMENT
02/94
AMENDMENT NO. 0003

PART 1 GENERAL

1.1 LUMP SUM PAYMENT ITEMS

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 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, environmental protection, meeting safety requirements, tests and reports, and for performing all work required.

1.1.1 Area B-Area G (Base Bid)

1.1.2 Option 1 - Area H

1.1.3 Option 2 - Area I

1.1.4 Option 3 - Area J

1.1.5 Option 4 - Area K

1.1.6 Option 5 - Area L

1.1.7 Option 6 - Area M

1.2 UNIT PRICE PAYMENT ITEMS (AREA A)

Payment items for the 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. (Am#3)

1.2.1 Water Lines in Non-Paved Areas

1.2.1.1 Payment

Payment will cover all costs associated with water line installation in non-paved areas, including excavation, bedding, pipe installation, backfill, 2-inch gravel mulch cover on disturbed surfaces, and all work associated with pressure, leakage, and biological testing.

1.2.1.2 Measurement

Measurement will be by the linear foot measured on the surface of the ground through valves and fittings, rounded up to the nearest one foot increment.

1.2.1.3 Unit of Measure

Unit of measure: Lineal feet.

1.2.2 Water Lines in Paved Areas

1.2.2.1 Payment

Payment will cover all costs associated with water line installation in paved areas, including excavation, haul-off of excavated material, bedding, pipe installation, and all work associated with pressure, leakage, and biological testing. Removal and replacement of pavement surfaces will be by separate unit price.

1.2.2.2 Measurement

Measurement will be by the linear foot measured on the surface of the ground through valves and fittings, rounded up to the nearest one foot increment.

1.2.2.3 Unit of Measure

Unit of measure: Lineal feet.

1.2.3 **[AM#3] DELETED**

1.2.4 **[AM#3] DELETED**

1.2.5 Fire Hydrants

1.2.5.1 Payment

Payment will cover all costs associated with fire hydrant installation, including excavation, fire hydrant installation, thrust blocking, cathodic protection, gravel drainage bed, backfill with 2-inch gravel mulch cover on disturbed non-paved areas or haul-off of excavated materials under pavements, and flow testing and hydrant painting after completion of project, etc. Removal and replacement of pavement surfaces disturbed by excavation for fire hydrants will be by separate unit price.

1.2.5.2 Measurement

Measurement will be by each fire hydrant.

1.2.5.3 Unit of Measure

Unit of measure: Each.

1.2.6 Pipe Bollards

1.2.6.1 Payment

Payment will cover all costs associated with pipe bollard installation, where directed by the Contracting Officer, including excavation, pipe bollard installation, backfill with 2-inch gravel mulch cover on disturbed non-paved areas, or haul-off of excavated materials under pavements. Removal and replacement of pavement surfaces disturbed by excavation for pipe bollards will be by separate unit price.

1.2.6.2 Measurement

Measurement will be by each pipe bollard.

1.2.6.3 Unit of Measure

Unit of measure: Each.

1.2.7 Gate Valves

1.2.7.1 Payment

Payment will cover all costs associated with gate valve installation, including excavation, bedding, gate valve installation, cathodic protection, valve box, backfill with 2-inch gravel mulch cover on disturbed non-paved areas or haul-off of excavated materials under pavements. Removal and replacement of pavement surfaces disturbed by excavation for gate valves will be by separate unit price.

1.2.7.2 Measurement

Measurement will be by each valve.

1.2.7.3 Unit of Measure

Unit of measure: Each.

1.2.8 Reducers

1.2.8.1 Payment

Payment will cover all costs associated with reducer installation, including excavation, bedding, reducer installation, cathodic protection, thrust blocking, backfill with 2-inch gravel mulch cover on disturbed non-paved areas or haul-off of excavated materials under pavements. Removal and replacement of pavement surfaces disturbed by excavation for reducers will be by separate unit price.

1.2.8.2 Measurement

Measurement will be by each reducer.

1.2.8.3 Unit of Measure

Unit of measure: Each.

1.2.9 Tees

1.2.9.1 Payment

Payment will cover all costs associated with tee installation, including excavation, bedding, tee installation, cathodic protection, thrust blocking, backfill with 2-inch gravel mulch cover on disturbed non-paved areas or haul-off of excavated materials under pavements. Removal and replacement of pavement surfaces disturbed by excavation for tees will be by separate unit price.

1.2.9.2 Measurement

Measurement will be by each tee.

1.2.9.3 Unit of Measure

Unit of measure: Each.

1.2.10 90 Degree Bends

1.2.10.1 Payment

Payment will cover all costs associated with 90 degree bend installation, including excavation, bedding, 90 degree bend installation, cathodic protection, thrust blocking, backfill with 2-inch gravel mulch cover on disturbed non-paved areas or haul-off of excavated materials under pavements. Removal and replacement of pavement surfaces disturbed by excavation for 90 degree bends will be by separate unit price.

1.2.10.2 Measurement

Measurement will be by each 90 degree bend.

1.2.10.3 Unit of Measure

Unit of measure: Each.

1.2.11 45 Degree Bends

1.2.11.1 Payment

Payment will cover all costs associated with 45 degree bend installation, including excavation, bedding, 45 degree bend installation, cathodic protection, thrust blocking, backfill with 2-inch gravel mulch cover on disturbed non-paved areas or haul-off of excavated materials under pavements. Removal and replacement of pavement surfaces disturbed by excavation for 45 degree bends will be by separate unit price.

1.2.11.2 Measurement

Measurement will be by each 45 degree bend.

1.2.11.3 Unit of Measure

Unit of measure: Each.

1.2.12 22-1/2 Degree Bends

1.2.12.1 Payment

Payment will cover all costs associated with 22-1/2 degree bend installation, including excavation, bedding, 22-1/2 degree bend installation, cathodic protection, thrust blocking, backfill with 2-inch gravel mulch cover on disturbed non-paved areas or haul-off of excavated materials under pavements. Removal and replacement of pavement surfaces disturbed by excavation for 22-1/2 degree bends will be by separate unit price.

1.2.12.2 Measurement

Measurement will be by each 22-1/2 degree bend.

1.2.12.3 Unit of Measure

Unit of measure: Each.

1.2.13 11-1/4 Degree Bends

1.2.13.1 Payment

Payment will cover all costs associated with 11-1/4 degree bend installation, including excavation, bedding, 11-1/4 degree bend installation, cathodic protection, thrust blocking, backfill with 2-inch gravel mulch cover on disturbed non-paved areas or haul-off of excavated materials under pavements. Removal and replacement of pavement surfaces disturbed by excavation for 11-1/4 degree bends will be by separate unit price.

1.2.13.2 Measurement

Measurement will be by each 11-1/4 degree bend.

1.2.13.3 Unit of Measure

Unit of measure: Each.

1.2.14 Solid Sleeves

1.2.14.1 Payment

Payment will cover all costs associated with solid sleeve installation, including excavation, bedding, solid sleeve installation, cathodic protection, thrust blocking, backfill with 2-inch gravel mulch cover on disturbed non-paved areas or haul-off of excavated materials under pavements. Removal and replacement of pavement surfaces disturbed by excavation for solid sleeves will be by separate unit price.

1.2.14.2 Measurement

Measurement will be by each solid sleeve.

1.2.14.3 Unit of Measure

Unit of measure: Each.

1.2.15 Tapping Sleeve and Valve with Valve Box

1.2.15.1 Payment

Payment will cover all costs associated with tapping sleeve and valve with valve box installation, including excavation, bedding, tapping sleeve and valve with valve box installation, cathodic protection, thrust blocking, backfill with 2-inch gravel mulch cover on disturbed non-paved areas or haul-off of excavated materials under pavements. Removal and replacement of pavement surfaces disturbed by excavation for tapping sleeve and valve with valve box will be by separate unit price.

1.2.15.2 Measurement

Measurement will be by each tapping sleeve and valve with valve box.

1.2.15.3 Unit of Measure

Unit of measure: Each.

1.2.16 Cut and Cap

1.2.16.1 Payment

Payment will cover all costs associated with cut and cap installation, including excavation, bedding, anchor collar with rods, cut and cap installation, cathodic protection, thrust blocking of cap, backfill with 2-inch gravel mulch cover on disturbed non-paved areas or haul-off of excavated materials under pavements. Removal and replacement of pavement surfaces disturbed by excavation for cut and cap will be by separate unit price. Contractor must install temporary cut and cap anchoring (anchor collar with rods) to provide for immediate resumption of water service after completion of cut and cap.

1.2.16.2 Measurement

Measurement will be by each cut and cap.

1.2.16.3 Unit of Measure

Unit of measure: Each.

1.2.17 Remove Existing Piping (Not Asbestos Cement) In Non-Paved Areas

1.2.17.1 Payment

Payment will cover all costs associated with removing existing pipe (not asbestos cement) in non-paved areas, including excavation, pipe removal and disposal, removal and disposal of associated blocking, valves, fittings, fire hydrants, etc., and backfill with 2-inch gravel mulch cover on disturbed surfaces.

1.2.17.2 Measurement

Measurement will be by the linear foot measured on the surface of the ground through valves and fittings, rounded to the nearest one foot.

1.2.17.3 Unit of Measure

Unit of measure: Lineal feet.

1.2.18 Remove Existing Piping (Not Asbestos Cement) In Paved Areas

1.2.18.1 Payment

Payment will cover all costs associated with removing existing pipe (not asbestos cement) in paved areas, including excavation, pipe removal and disposal, removal and disposal of associated blocking, valves, fittings, fire hydrants, etc., and haul-off of excavation. Removal and replacement of pavement surfaces disturbed by excavation for removing existing piping will be by separate unit price.

1.2.18.2 Measurement

Measurement will be by the linear foot measured on the surface of the ground through valves and fittings, rounded to the nearest one foot.

1.2.18.3 Unit of Measure

Unit of measure: Lineal feet.

1.2.19 Remove Existing Asbestos Cement Piping In Non-Paved Areas

1.2.19.1 Payment

Payment will cover all costs associated with removing existing asbestos cement pipe in non-paved areas, including excavation, pipe removal and disposal, removal and disposal of associated blocking, valves, fittings, fire hydrants, etc., and backfill with 2-inch gravel mulch cover on disturbed surfaces.

1.2.19.2 Measurement

Measurement will be by the linear foot measured on the surface of the ground through valves and fittings, rounded to the nearest one foot.

1.2.19.3 Unit of Measure

Unit of measure: Lineal feet.

1.2.20 Remove Existing Asbestos Cement Piping In Paved Areas

1.2.20.1 Payment

Payment will cover all costs associated with removing existing asbestos cement pipe in paved areas, including excavation, pipe removal and disposal, removal and disposal of associated blocking, valves, fittings, fire hydrants, etc., and haul-off of excavation. Removal and replacement of pavement surfaces disturbed by excavation for removing existing piping will be by separate unit price.

1.2.20.2 Measurement

Measurement will be by the linear foot measured on the surface of the ground through valves and fittings, rounded to the nearest one foot.

1.2.20.3 Unit of Measure

Unit of measure: Lineal feet.

1.2.21 Flowable Backfill

1.2.21.1 Payment

Payment will cover all costs associated with installing flowable backfill to the underside of paved surfaces.

1.2.21.2 Measurement

Measurement will be by the square yard of surface area rounded up to the nearest whole square yard increment.

1.2.21.3 Unit of Measure

Unit of measure: Square yard.

1.2.22 Aggregate Surface Course

1.2.22.1 Payment

Payment will cover all costs associated with removal of existing aggregate surface course and replacement with 6-inch aggregate surface course.

1.2.22.2 Measurement

Measurement will be by the square yard of surface area rounded up to the nearest whole square yard increment.

1.2.22.3 Unit of Measure

Unit of measure: Square yard.

1.2.23 Concrete Walk Replacement

1.2.23.1 Payment

Payment will cover all costs associated with removal of existing concrete walk, and replacement with 4-inch concrete walk.

1.2.23.2 Measurement

Measurement will be by the square foot of surface area rounded up to the nearest whole square foot increment.

1.2.23.3 Unit of Measure

Unit of measure: Square foot.

1.2.24 Concrete Pavement Replacement

1.2.24.1 Payment

Payment will cover all costs associated with removal of existing concrete pavement, and replacement with 8-inch concrete pavement.

1.2.24.2 Measurement

Measurement will be by the square yard of surface area rounded up to the nearest whole square yard increment.

1.2.24.3 Unit of Measure

Unit of measure: Square yard.

1.2.25 Asphalt Pavement Replacement

1.2.25.1 Payment

Payment will cover all costs associated with removal of existing asphalt pavement, and replacement with 4-inch bituminous base course and 2-inch asphalt surface course.

1.2.25.2 Measurement

Measurement will be by the square yard of asphalt surface course rounded up to the nearest whole square yard increment.

1.2.25.3 Unit of Measure

Unit of measure: Square yard.

1.2.26 Curb and Gutter Replacement

1.2.26.1 Payment

Payment will cover all costs associated with removal and replacement of curb and gutter.

1.2.26.2 Measurement

Measurement will be by the linear foot rounded up to the nearest one foot increment.

1.2.26.3 Unit of Measure

Unit of measure: Lineal feet.

1.2.27 Concrete Encase Water Line

1.2.27.1 Payment

Payment will cover all costs associated with installation of concrete encasement of water lines, where directed by the Contracting Officer, with 6-inch minimum concrete cover of pipe all around.

1.2.27.2 Measurement

Measurement will be by the linear foot rounded up to the nearest one foot increment.

1.2.27.3 Unit of Measure

Unit of measure: Lineal feet.

1.2.28 2-Inch Blow-Off

1.2.28.1 Payment

Payment will cover all costs associated with installation of 2-inch blow-offs, where directed by the Contracting Officer, including excavation, bedding, tapping saddle, 2-inch valve, pipe and fittings, cathodic protection, cast iron access box, and backfill with 2-inch gravel mulch cover on disturbed surfaces.

1.2.28.2 Measurement

Measurement will be by each 2-inch blow-off.

1.2.28.3 Unit of Measure

Unit of measure: Each.

1.2.29 2-Inch Meter In Meter Box

1.2.29.1 Payment

Payment will cover all costs associated with installation and connection of 2-inch meters in meter box, where directed by the Contracting Officer, including excavation, bedding, installation of 2-inch meter in meter box and backfill with 2-inch gravel mulch cover on disturbed surfaces.

1.2.29.2 Measurement

Measurement will be by each 2-inch meter in meter box.

1.2.29.3 Unit of Measure

Unit of measure: Each.

1.2.30 1-Inch Meter In Meter Box

1.2.30.1 Payment

Payment will cover all costs associated with installation of 1-inch meters in meter box, where directed by the Contracting Officer, including excavation, bedding, installation of 1-inch meter in meter box and backfill with 2-inch gravel mulch cover on disturbed surfaces.

1.2.30.2 Measurement

Measurement will be by each 1-inch meter in meter box.

1.2.30.3 Unit of Measure

Unit of measure: Each.

1.2.31 1-Inch Manual Air Release Valve

1.2.31.1 Payment

Payment will cover all costs associated with installation of 1-inch manual air release valve in access boxes, where directed by the Contracting Officer, including excavation, bedding, installation of tapping saddle with 1-inch corporation stop, type K soft copper gooseneck to 1-foot above grade, cast iron access box and cover, and backfill and surface replacement as required for pipe.

1.2.31.2 Measurement

Measurement will be by each 1-inch manual air release valve in access box.

1.2.31.3 Unit of Measure

Unit of measure: Each.

1.2.32 Couplings For Tie-Ins

1.2.32.1 Payment

Payment will cover all costs associated with installation of couplings for tie-ins to existing water service lines, where directed by the Contracting Officer, including excavation, bedding, installation of couplings, cathodic protection if ferrous coupling used, and backfill and surface replacement as required for pipe.

1.2.32.2 Measurement

Measurement will be by each coupling.

1.2.32.3 Unit of Measure

Unit of measure: Each.

1.2.33 Trench Rock Excavation

1.2.33.1 Payment

Payment will cover all costs associated with removal of rock from trenches and replacement with satisfactory materials, including rock excavation, rock haul off and backfill with satisfactory materials (where it occurs in non-paved areas).

1.2.33.2 **[AM#3]** **Measurement**

Rock excavation material in trenches is material which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42 inch wide bucket on track mounted excavator equivalent to Caterpillar model 215, rated at not less than 90 HP flywheel power and 30,000 lb drawbar pull. Measurement will be for the average depth of rock excavated times a 4 foot wide trench (the Contractor's trench width will not be a factor) times the length of excavation.

1.2.33.3 Unit of Measure

Unit of Measure: cubic yard.

1.2.34 **[AM#3] Mount Franklin Red Landscape Rock With Woven Weed Barrier Underlayment**

1.2.34.1 **Payment**

Payment will cover all costs associated with providing and spreading Mount Franklin Red Landscape Rock with woven weed barrier underlayment in landscape areas, including subgrade preparation, installing woven weed barrier underlayment, and spreading 3 inches of Mount Franklin Red Landscape Rock to produce a finished surface which matches existing landscaping.

1.2.34.2 **Measurement**

Measurement will be by certified weigh tickets provided daily to the Contracting Officer.

1.2.34.3 **Unit of Measure**

Unit of Measure: ton.

1.2.35 **[AM#3] Ductile Iron Pipe Above Ground**

1.2.35.1 **Payment**

Payment will cover all costs associated with installing ductile iron pipe above ground including provision of 8 inch bedding, installation of 12 inch restrained joint ductile iron pipe, installation of fill to 3'-0" above top of pipe with 5:1 minimum slope back to grade, and cover of exposed earth surfaces resulting from the Contractor's operations with 2 inch thickness gravel mulch.

1.2.35.2 **Measurement**

Measurement will be by the linear foot measured on the surface of the ground through valves and fittings, rounded up to the nearest one foot increment.

1.2.35.3 **Unit of Measure**

Unit of Measure: lineal feet.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section --

SECTION 02220

DEMOLITION
05/02
AMENDMENT NO. 0002 & 0003

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.6	(1990; R 1998) Safety Requirements for Demolition Operations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61-SUBPART M	National Emission Standard for Asbestos

1.2 GENERAL REQUIREMENTS

Do not begin demolition until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the reservoirs or inside or outside the buildings . The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Notification to TDH; G

Notification of building demolition activity, signed by the

Installation representative, shall be provided to the Texas Department of Health (TDH) no later than 10 days before demolition of any structure. The Contractor shall submit a receipt of proof of notification to the Contracting Officer.

SD-03 Product Data

Work Plan;

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

SD-07 Certificates

Demolition plan; G

Notifications; G

Notification of Demolition and Renovation forms; G

Submit proposed salvage, demolition and removal procedures to the Contracting Officer for approval before work is started.

SD-11 Closeout Submittals

Receipts

1.4 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," safety requirements shall conform with ANSI A10.6.

1.4.1 Notifications

Furnish timely notification of demolition projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61-SUBPART M. Notify the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61-SUBPART M.

Complete and submit Notification of Demolition and Renovation forms to Federal and State authorities and Contracting Officer, including Notification to TDH, postmarked or delievered at least ten working days prior to commencement of work, in accordance with 40 CFR 61-SUBPART M.

1.5 DUST AND DEBRIS CONTROL

Prevent the spread of dust and debris to occupied portions of the structure or adjacent buildings and avoid the creation of a nuisance or hazard in the

surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.6 PROTECTION

1.6.1 Traffic Control Signs

Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Notify the Contracting Officer prior to beginning such work.

1.6.2 Existing Work

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal work. Repairs, reinforcement, or structural replacement must have Contracting Officer approval.

1.6.3 Trees

Trees within the project site which might be damaged during demolition, and which are indicated to be left in place, shall be protected by a 6 foot high fence. The fence shall be securely erected a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the work under this contract shall be replaced in kind or as approved by the Contracting Officer.

1.6.4 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, shall remain standing without additional bracing, shoring, of lateral support until demolished, unless directed otherwise by the Contracting Officer. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.6.5 Protection of Personnel

During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.7 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted .

1.8 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair items to be relocated which are damaged or replace damaged items with new undamaged items as approved by the Contracting Officer.

1.9 Required Data

Demolition plan shall include procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, and a detailed description of methods and equipment to be used for each operation and of the sequence of operations.

1.10 Environmental Protection

The work shall comply with the requirements of Section 01355 ENVIRONMENTAL PROTECTION .

1.11 USE OF EXPLOSIVES

Use of explosives will not be permitted.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Structures

The existing reservoir walls at Buildings 11172, 11173, and 4317 shall be removed **[AM#3] to 2 feet below grade unless shown otherwise on the Drawings.**. The existing reservoir at building 1318 shall be removed completely.

3.1.2 Utilities and Related Equipment

Remove existing utilities , as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility

and approved by the Contracting Officer. **[AM#2] When removing asbestos cement pipe, conform to requirements of Section 13280 ASBESTOS ABATEMENT. Asbestos cement pipe will not be removed below 5 feet of depth below grade unless directed by Contracting Officer's Representative. Transport poperly contained AC pipe to the Ft. Bliss landfill as indicated on the drawings.** When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area. Remove meters and related equipment and deliver to a location on the **[AM#2] Main Ft. Bliss cantonment** in accordance with instructions of the Contracting Officer. If utility lines are encountered that are not shown on drawings, contact the Contracting Officer for further instructions.

3.1.3 Paving and Slabs

Remove sawcut concrete and asphaltic concrete paving and slabs where required. Provide neat sawcuts at limits of pavement removal as indicated.

3.1.4 Concrete

Saw concrete along straight lines to a depth of not less than 2 inches. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete. **[AM#2] See Section 02221 PAVEMENT REMOVAL.**

3.1.5 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

a. Holes and depressions left as a result of removals in existing concrete walls to remain shall be completely filled with an approved concrete patching material, applied in accordance with the manufacturer's printed instructions.

3.2 DISPOSITION OF MATERIAL

3.2.1 Title to Materials

Except where specified in other sections, all materials and equipment removed, and not reused, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition and removal procedures, and authorization by the Contracting Officer to begin demolition. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

3.2.2 Salvaged Materials and Equipment

Remove materials and equipment that are indicated on drawings to be removed by the Contractor and that are to remain the property of the Government.

Contractor shall salvage items and material to the maximum extent possible.

Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

Salvaged items to remain the property of the Government shall be removed in a manner to prevent damage, and packed or crated to protect the items from damage while in storage. Items damaged during removal or storage shall be repaired or replaced to match existing items. Containers shall be properly identified as to contents. **[AM#2] Transport salvaged items to the contractor's designated laydown yard.**

[AM#2] Items to remain the property of the government are:

1. **Pumps.**
2. **Meters and meter boxes.**

3.2.3 Ferrous Material Recycling

All ferrous materials shall be salvaged for recycing. Ferrous materials may be **[AM#2]** _____ taken to a privately owned recycle center. Demolished fire hydrants cannot be reused because of the probability of lead paint coatings. To avoid friable lead abatement, the Contractor must not pull lead joints loose during demolition of cast iron pipe. Pipe and fittings containing lead joints and fire hydrants shall be stored in enclosed watertight containers until delivered to an approved recycle center.

3.2.4 Unsalvageable Material

Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of **[AM#2] off government controlled property**. **[AM#2]** _____ Combustible material shall be disposed of off the site.

3.3 CLEANUP

Debris and rubbish shall be removed from base slab and similar excavations. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

3.3.1 **[AM#2] DELETED**

-- End of Section --

SECTION 02316

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS
05/02
AMENDMENT NO. 0003

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180	(2001) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457-mm (18-in) Drop

ASTM INTERNATIONAL (ASTM)

ASTM D 1557	(2000) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2487	(2000) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(2001) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(2001) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

[AM#3] ASTM INTERNATIONAL (ASTM)

ASTM D 5034	**(1995; R 2001) Breaking Strength and Elongation of Textile Fabrics (Grab Test)**

1.2 DEGREE OF COMPACTION

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office

that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

[AM#3] SD-04 Samples

50 lb sample of Landscape Rock; G, RE
One sq ft of Woven Weed Fabric; G, RE

SD-06 Test Reports

Field Density Tests; G, RE
Testing of Backfill Materials; G, RE

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 2 inches. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials shall include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM shall be identified as cohesionless only when the fines have a plasticity index of zero.

2.1.4 Rock

Rock shall consist of boulders measuring 1/2 cubic yard or more and materials that cannot be removed without systematic drilling and blasting such as rock material in ledges, bedded deposits, unstratified masses and conglomerate deposits, and below ground concrete or masonry structures, exceeding 1/2 cubic yard in volume, except that pavements shall not be considered as rock.

2.1.5 **[AM#3] Landscape Rock**

Landscape rock shall be locally available Mount Franklin Red Landscape

Rock. Rock shall match size and color of existing landscape rock.

2.1.6 **Woven Weed Fabric**

Woven weed fabric for underlayment of landscape rock shall be woven polypropylene, polyester, or fiberglass, mat in accordance with ASTM D 5034. It shall be made specifically for use as a fabric around plant material. Nominal weight shall be a minimum 4 ounces per square yard. Permeability rate shall be a minimum 0.4 inches per second.

2.1.7 Unyielding Material

Unyielding material shall consist of rock and gravelly soils with stones greater than 3 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

2.1.8 Unstable Material

Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

2.1.9 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a No. 200 mesh sieve and no less than 95 percent by weight passing the l inch sieve. The maximum allowable aggregate size shall be 2 inches, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

2.1.10 Bedding

Bedding shall be a coarse sand.

2.2 PLASTIC MARKING TAPE

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Blue:	Water Systems

2.3 Detection Wire For Non-Metalic Piping

Detection wire shall be insulated single strand, solid copper with a minimum diameter of 12 AWG.

PART 3 EXECUTION

3.1 EXCAVATION

Excavation shall be performed to the lines and grades indicated. Rock excavation shall include removal and disposition of material defined as rock in paragraph MATERIALS. Earth excavation shall include removal and disposal of material not classified as rock excavation. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 2 feet. Excavated material not required or not satisfactory for backfill shall be removed from the site . Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating shall be removed to maintain the stability of the bottom and sides of the excavation. Unauthorized overexcavation shall be backfilled in accordance with paragraph BACKFILLING AND COMPACTION at no additional cost to the Government.

3.1.1 Trench Excavation Requirements

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than 5 feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Vertical trench walls more than 10 feet high shall be shored. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter and shall not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

3.1.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to allow for 6 inch bedding. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing.

3.1.1.2 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

3.1.1.3 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, or similar structures shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock shall be cleaned of loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Loose disintegrated rock and thin strata shall be removed. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.1.1.4 **[AM#3] DELETED**

3.1.2 Stockpiles

Stockpiles of satisfactory and unsatisfactory and wasted materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government. Locations of stockpiles of satisfactory materials shall be subject to prior approval of the Contracting Officer.

3.2 BACKFILLING AND COMPACTION

Backfill material shall consist of satisfactory material or select granular material as required. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils, unless otherwise specified. If an approved two-sack cement/sand mix is used, it may be deposited in one lift to match the full depth of backfill required.

3.2.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The joints and couplings shall be left uncovered during the pressure test.

3.2.1.1 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

3.2.1.2 Bedding

Bedding shall be of the type and thickness shown.

3.2.1.3 Final Backfill

The remainder of the trench, except for special materials for roadways, railroads and airfields, shall be filled with satisfactory material. The remainder of the trench for roadways, railroads, and airfields shall be filled with select granular material or an approved two-sack cement/sand mix. Backfill material shall be placed and compacted as follows:

a. Roadways, Railroads, and Airfields: Backfill shall be placed up to the elevation at which the requirements in Section 02300 EARTHWORK control. Water flooding or jetting methods of compaction will not be permitted.

b. Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inch loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

3.2.1.4 Flowable Backfill

Flowable Backfill: Where trenches cross asphalt or concrete streets, the backfill material shall be Flowable Backfill material as follows: 100 psi, medium mix, 50 lbs cement, 200 lbs fly ash, 2800 lbs sand, 60 gallons water = 1 cubic yard of mortar. Flowable Backfill shall be used in the entire excavated area across a roadway up to the bottom of the final pavement. A mix design with test cylinder break reports for that particular mix design shall be submitted (the same as shop drawings) to the Contracting Authority for review and possible approval prior to construction. During construction, test cylinders, as often as directed by the Contracting Authority, shall be made and tested for flowable backfill to the satisfaction of the Contracting Authority. Flowable backfill may be deemed unacceptable if, in the opinion of the Contracting Authority, test results indicate the strength is too high. It is the intent of these specifications to provide flowable backfill that can be removed by a standard rubber tire backhoe without the use of special equipment such as jackhammers.

In addition to the above, the new water line shall be bedded from the trench bottom to a point 6 inches above the pipe with crushed stone granular material compacted to 90 percent Modified Proctor Density per AASHTO T 180, before placing flowable backfill in the trench.

3.2.2 Backfill for Appurtenances

After the thrust blocks or similar structure has been constructed and the concrete has been allowed to cure for 3 days, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.3 **[AM#3] Landscaped Area Restoration in Area A**

Landscape rock shall be 3 inches thick on top of woven weed fabric (fabric splices shall be lapped 12 inches minimum) to match the look of the existing landscaped areas.

3.4 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.4.1 Water Lines

Trenches shall be of a depth to provide a minimum cover of 3 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

3.4.2 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 18 inches below finished grade unless otherwise shown.

3.5 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

3.5.1 Testing Facilities

Tests shall be performed by an approved commercial testing laboratory or may be tested by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer.

3.5.2 Testing of Backfill Materials

Classification of backfill materials shall be determined in accordance with ASTM D 2487 and the moisture-density relations of soils shall be determined in accordance with ASTM D 1557. A minimum of one soil classification and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.

3.5.3 Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 200 feet of installation shall be performed. One moisture density relationship shall be determined for every 1500 cubic yards of material used. Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. The

calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the Contracting Officer. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

-- End of Section --

SECTION 02510A

WATER DISTRIBUTION SYSTEM
05/02
AMENDMENT NO. 0003

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN WATER WORKS ASSOCIATION(AWWA)

AWWA B300	(1999) Hypochlorites
AWWA B301	(1999) Liquid Chlorine
AWWA C104	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110	(1998) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1219 mm), for Water
AWWA C111	(2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115	(1999) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C151	(2002) Ductile-Iron Pipe, Centrifugally Cast, for Water
AWWA C153	(2000) Ductile-Iron Compact Fittings for Water Service
AWWA C500	(2002; A C500a-95) Metal-Seated Gate Valves for Water Supply Service
AWWA C502	(1994) Dry-Barrel Fire Hydrants
AWWA C509	(2001) Resilient-Seated Gate Valves for Water Supply Service
AWWA C600	(1999) Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C606	(1997) Grooved and Shouldered Joints
AWWA C651	(1999) Disinfecting Water Mains

AWWA C800	(2001) Underground Service Line Valves and Fittings
AWWA C900	(1997) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution
AWWA C905	(1997) Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 14 In. Through 48 In. (350 mm through 1,200 mm)
AWWA M23	(2002) Manual: PVC Pipe - Design and Installation

ASBESTOS CEMENT PRODUCT PRODUCERS ASSOCIATION (ACPPA)

ACPPA 1344	(1988) Recommended Work Practices for A/C Pipe

ASME INTERNATIONAL (ASME)

ASME B1.20.1	(1983; R 2001) Pipe Threads, General Purpose, Inch
ASME B16.1	(1998) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.26	(1988) Cast Copper Alloy Fittings for Flared Copper Tubes

ASTM INTERNATIONAL (ASTM)

ASTM B 88	(2002) Seamless Copper Water Tube
ASTM B 88M	(1999) Seamless Copper Water Tube (Metric)
ASTM D 1784	(1999ae1) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(1999) Poly(Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241	(2000) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2464	(1999) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	(2002) Poly(Vinyl Chloride)(PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2467	(2002) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564	(2002) Solvent Cements for Poly(Vinyl

	Chloride) (PVC) Plastic Piping Systems
ASTM D 2855	(1996; R 2002) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM F 477	(2002e1) Elastomeric Seals (Gaskets) for Joining Plastic Pipe

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)

DIPRA TRD	(2002) Thrust Restraint Design for Ductile Iron Pipe

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-80	(1997) Bronze Gate, Globe, Angle and Check Valves

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 24	(1995) Installation of Private Fire Service Mains and Their Appurtenances
NFPA 325-1	(1994) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids
NFPA 49	(1994) Hazardous Chemicals Data
NFPA 704	(2001) Identification of the Fire Hazards of Materials for Emergency Response

NSF INTERNATIONAL (NSF)

NSF 14	(20029) Plastics Piping Components and Related Materials
NSF 61	(2001; Addendum 1 - Sep 2001) Drinking Water System Components - Health Effects

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 21	(1982; R 2000) White or Colored Silicone Alkyd Paint
SSPC Paint 25	(1997; R 2000) Zinc Oxide, Aklyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II

1.2 PIPING

This section covers water distribution and service lines, and connections to building service at a point approximately 5 feet outside buildings and structures to which service is required. The Contractor shall have a copy of the manufacturer's recommendations for each material or procedure to be utilized available at the construction site at all times.

1.2.1 Service Lines

Piping for water service lines less than 3 inchesin diameter shall be polyvinyl chloride (PVC) plastic, or copper tubing, unless otherwise shown or specified. Piping for water service lines 3 inchesand larger shall be ductile iron or polyvinyl chloride (PVC) plastic.

1.2.2 Distribution Lines 80 mm (3 Inches) or Larger

Piping for water distribution lines 3 inches or larger shall be ductile iron **[AM#3]** **or** polyvinyl chloride (PVC) through 36 inch nominal diameter plastic, **[AM#3]** _____ unless otherwise shown or specified.

1.2.3 Supply Lines 80 mm (3 Inches) or Larger

Piping for water supply lines 3 inches or larger shall be ductile iron or polyvinyl chloride (PVC) plastic, through 36 inch nominal diameter.

1.2.4 Sprinkler Supply Lines

Piping for water lines supplying sprinkler systems for building fire protection shall conform to NFPA 24 from the point of connection with the water distribution system to the building 5 foot line.

1.2.5 Potable Water Lines

Piping and components of potable water systems which come in contact with the potable water shall conform to NSF 61.

1.2.6 Plastic Piping System

Plastic piping system components (PVC) intended for transportation of potable water shall comply with NSF 14 and be legibly marked with their symbol.

1.2.7 Excavation, Trenching, and Backfilling

Excavation, trenching, and backfilling shall be in accordance with the applicable provisions of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, except as modified herein.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Installation;

The manufacturer's recommendations for each material or procedure to be utilized.

Waste Water Disposal Method;

The method proposed for disposal of waste water from hydrostatic tests and disinfection, prior to performing hydrostatic tests.

Satisfactory Installation;

A statement signed by the principal officer of the contracting firm stating that the installation is satisfactory and in accordance with the contract drawings and specifications, and the manufacturer's prescribed procedures and techniques, upon completion of the project and before final acceptance.

SD-06 Test Reports

Bacteriological Disinfection;

Test results from commercial laboratory verifying disinfection.

SD-07 Certificates

Meters;

Manufacturer's certificate stating that each meter furnished has been tested for accuracy of registration and compliance with the accuracy and capacity requirements of the appropriate AWWA standard.

1.4 HANDLING

Pipe and accessories shall be handled to ensure delivery to the trench in sound, undamaged condition, including no injury to the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor in a satisfactory manner, at no additional cost to the Government. No other pipe or material shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

1.4.1 Miscellaneous Plastic Pipe and Fittings

Polyvinyl Chloride (PVC) pipe and fittings shall be handled and stored in accordance with the manufacturer's recommendations. Storage facilities shall be classified and marked in accordance with NFPA 704, with classification as indicated in NFPA 49 and NFPA 325-1.

PART 2 PRODUCTS

2.1 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Plastic Pipe

2.1.1.1 PVC Plastic Pipe

Pipe, couplings and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B.

a. Pipe Less Than 4 inch Diameter:

(1) Screw-Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 Schedule 80, with joints meeting requirements of 150 psi working pressure, 200 psi hydrostatic test pressure, unless otherwise shown or specified. Pipe couplings when used, shall be tested as required by ASTM D 2464.

(2) Elastomeric-Gasket Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 Schedule 40, with joints meeting the requirements of 150 psi working pressure, 200 psi hydrostatic test pressure, unless otherwise shown or specified, or it may be pipe conforming to requirements of ASTM D 2241, elastomeric joint, with the following applications:

SDR	Maximum Working Pressure psi	Minimum Hydrostatic Pressure psi
17	150	200

(3) Solvent Cement Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 or ASTM D 2241 with joints meeting the requirements of 150 psi working pressure and 200 psi hydrostatic test pressure.

b. Pipe 4 through 12 inch Diameter: Pipe, couplings and fittings shall conform to AWWA C900, Class 150, CIOD pipe dimensions, elastomeric-gasket joint, unless otherwise shown or specified.

c. Pipe 14 through 36 inch Diameter: Pipe shall conform to AWWA C905 **[AM#3] DR 21,** unless otherwise shown or specified.

2.1.2 Ductile-Iron Pipe

[AM#3] For pipe 14 inches and larger (and where shown on the drawings), Ductile-iron pipe shall conform to AWWA C151, working pressure not less than 150 psi, unless otherwise shown or specified. Pipe shall be cement-mortar lined in accordance with AWWA C104. Linings shall be standard. When installed underground, pipe shall be coated in accordance with Section 13110 CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE). Flanged ductile iron pipe with threaded flanges shall be in accordance with AWWA C115.

2.1.3 Copper Tubing

Copper tubing shall conform to ASTM B 88, Type K, annealed.

2.2 FITTINGS AND SPECIALS

2.2.1 PVC Pipe System

a. For pipe less than 4 inch diameter, fittings for threaded pipe shall conform to requirements of ASTM D 2464, threaded to conform to the requirements of ASME B1.20.1 for use with Schedule 80 pipe and fittings; fittings for solvent cement jointing shall conform to ASTM D 2466 or ASTM D 2467; and fittings for elastomeric-gasket joint pipe shall be iron conforming to AWWA C110 or AWWA C111. Iron fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA C104.

b. For pipe 4 inch diameter and larger, fittings and specials shall be iron, bell end in accordance with AWWA C110, 150 psi pressure rating unless otherwise shown or specified, except that profile of bell may have special dimensions as required by the pipe manufacturer; or fittings and specials may be of the same material as the pipe with elastomeric gaskets, all in conformance with AWWA C900. Iron fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA C104. Fittings shall be bell and spigot or plain end pipe, or as applicable. Ductile iron compact fittings shall be in accordance with AWWA C153.

2.2.2 Ductile-Iron Pipe System

Fittings and specials shall be suitable for 150 psi pressure rating, unless otherwise specified. Fittings and specials for mechanical joint pipe shall conform to AWWA C110. Fittings and specials for use with push-on joint pipe shall conform to AWWA C110 and AWWA C111. Fittings and specials for grooved and shouldered end pipe shall conform to AWWA C606. Fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA C104. Ductile iron compact fittings shall conform to AWWA C153.

2.2.2.1 Dielectric Fittings

Dielectric fittings shall be installed between threaded ferrous and nonferrous metallic pipe, fittings and valves, except where corporation stops join mains. Dielectric fittings shall prevent metal-to-metal contact of dissimilar metallic piping elements and shall be suitable for the required working pressure.

2.2.3 Copper Tubing System

Fittings and specials shall be flared and conform to ASME B16.26.

2.3 JOINTS

2.3.1 Plastic Pipe Jointing

2.3.1.1 PVC Pipe

Joints, fittings, and couplings shall be as specified for PVC pipe. Joints connecting pipe of differing materials shall be made in accordance with the

manufacturer's recommendations, and as approved by the Contracting Officer.

2.3.2 Ductile-Iron Pipe Jointing

a. Mechanical joints shall be of the stuffing box type and shall conform to AWWA C111.

b. Push-on joints shall conform to AWWA C111.

c. Rubber gaskets and lubricants shall conform to the applicable requirements of AWWA C111.

2.3.3 Bonded Joints

For ductile iron pipe installed underground, a metallic bond shall be provided at each joint, including joints made with flexible couplings, caulking, or rubber gaskets, of ferrous metallic piping to effect continuous conductivity. The bond wire shall be Size 1/0 copper conductor suitable for direct burial shaped to stand clear of the joint. The bond shall be of the thermal weld type.

2.3.4 Isolation Joints

Isolation joints shall be installed between nonthreaded ferrous and nonferrous metallic pipe, fittings and valves. Isolation joints shall consist of a sandwich-type flange isolation gasket of the dielectric type, isolation washers, and isolation sleeves for flange bolts. Isolation gaskets shall be full faced with outside diameter equal to the flange outside diameter. Bolt isolation sleeves shall be full length. Units shall be of a shape to prevent metal-to-metal contact of dissimilar metallic piping elements.

a. Sleeve-type couplings shall be used for joining plain end pipe sections. The two couplings shall consist of one steel middle ring, two steel followers, two gaskets, and the necessary steel bolts and nuts to compress the gaskets.

b. Split-sleeve type couplings may be used in aboveground installations when approved in special situations and shall consist of gaskets and a housing in two or more sections with the necessary bolts and nuts.

2.3.5 Copper Tubing Jointing

Joints shall be compression-pattern flared and shall be made with the specified fittings.

2.4 VALVES

2.4.1 Check Valves

Check valves shall be designed for a minimum working pressure of 150 psi or as indicated. Valves shall have a clear waterway equal to the full nominal diameter of the valve. Valves shall open to permit flow when inlet pressure is greater than the discharge pressure, and shall close tightly to prevent return flow when discharge pressure exceeds inlet pressure. The size of the valve, working pressure, manufacturer's name, initials, or

trademark shall be cast on the body of each valve. Valves 2 inches and larger shall be outside lever and weight type.

a. Valves 2 inches and smaller shall be all bronze designed for screwed fittings, and shall conform to MSS SP-80, Class 150, Types 3 and 4 as suitable for the application.

b. Valves larger than 2 inches shall be iron body, bronze mounted, shall have flanged ends, and shall be the non-slam type. Flanges shall be the Class 125 type conforming to ASME B16.1.

2.4.2 Gate Valves

Gate valves shall be designed for a working pressure of not less than 150 psi. Valve connections shall be as required for the piping in which they are installed. Valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counterclockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.

a. Valves smaller than 3 inches shall be all bronze and shall conform to MSS SP-80, Type 1, Class 150.

b. Valves 3 inches and larger shall be iron body, bronze mounted, and shall conform to AWWA C500. Flanges shall not be buried. An approved pit shall be provided for all flanged connections.

c. Resilient-Seated Gate Valves: For valves 3 inches and larger in size, resilient-seated gate valves shall conform to AWWA C509.

2.4.3 Indicator Post for Valves

[AM#3] **Where** shown on the drawings **valves** shall be equipped with indicator post conforming to the requirements of NFPA 24. Operation shall be by a wrench which shall be attached to each post.

2.5 VALVE BOXES

Valve boxes shall be cast iron or concrete, except that concrete boxes may be installed only in locations not subjected to vehicular traffic. Cast-iron boxes shall be extension type with slide-type adjustment and with flared base. The minimum thickness of metal shall be 3/16 inch. Concrete boxes shall be the standard product of a manufacturer of precast concrete equipment. The word "WATER" shall be cast in the cover. The box length shall adapt, without full extension, to the depth of cover required over the pipe at the valve location.

2.6 VALVE PITS

Valve pits shall be constructed at locations indicated or as required above and in accordance with the details shown. Concrete shall have compressive strength of 3000 psi in accordance with Section 03300CAST-IN-PLACE STRUCTURAL CONCRETE.

2.7 FIRE HYDRANTS

Hydrants shall be dry-barrel type conforming to AWWA C502 with valve

opening at least 5 inches in diameter and designed so that the flange at the main valve seat can be removed with the main valve seat apparatus remaining intact, closed and reasonably tight against leakage and with a breakable valve rod coupling and breakable flange connections located no more than 8 inches above the ground grade . Hydrants shall have a 6 inch bell connection, two 2-1/2 inch hose connections and one 4-1/2 inch pumper connection. Outlets shall have American National Standard fire-hose coupling threads. Working parts shall be bronze. Design, material, and workmanship shall be equal to the latest stock pattern ordinarily produced by the manufacturer. Hydrants shall be painted with 1 coat of red iron oxide, zinc oxide primer conforming to SSPC Paint 25 and 2 finish coats of silicone alkyd paint conforming to SSPC Paint 21, color in accordance with NFPA recommendations. Suitable bronze adapter for each outlet, with caps, shall be furnished.

2.8 MISCELLANEOUS ITEMS

2.8.1 Service Clamps

Service clamps shall have a pressure rating not less than that of the pipe to be connected and shall be either the single or double flattened strap type. Clamps shall have a galvanized malleable-iron body with cadmium plated straps and nuts. Clamps shall have a rubber gasket cemented to the body.

2.8.2 Corporation Stops

Corporation stops shall have standard corporation stop thread conforming to AWWA C800 on the inlet end, with flanged joints, compression pattern flared tube couplings, or wiped joints for connections to goosenecks.

2.8.3 Goosenecks

Copper tubing for gooseneck connections shall conform to the applicable requirements of ASTM B 88, Type K, annealed. Length of cable requirement connections shall be in accordance with standard practice.

2.8.4 Service Stops

Service stops shall be water-works inverted-ground-key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of service pipe used. All parts shall be of bronze with female iron-pipe-size connections or compression-pattern flared tube couplings, and shall be designed for a hydrostatic test pressure not less than 200 psi.

2.8.5 Tapping Sleeves

Tapping sleeves of the sizes indicated for connection to existing main shall be the cast gray, ductile, or malleable iron, split-sleeve type with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 150 psi. Bolts shall have square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe,

encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 50 foot-pound.

2.8.6 Service Boxes

Service boxes shall be cast iron or concrete and shall be extension service boxes of the length required for the depth of the line, with either screw or slide-type adjustment. The boxes shall have housings of sufficient size to completely cover the service stop or valve and shall be complete with identifying covers.

2.8.7 Disinfection

Chlorinating materials shall conform to the following:

Chlorine, Liquid: AWWA B301.

Hypochlorite, Calcium and Sodium: AWWA B300.

2.8.8 Meters

Meters shall conform to AWWA C700. Meter shall be positive displacement, oscillating piston, or nutating disc type; magnetic drive with magnetic shielding, straight reading sealed register graduated in cubic feet, all bronze split case, integral strainer, threaded ends, and pulse switch initiator. Meter shall be suitable for accurately measuring and handling water at pressure, temperatures and flow rates to be encountered. The pulse initiator shall provide the maximum number of pulses up to 500 per minute that is obtainable from the manufacturer. It shall not provide less than 1 pulse per 100 gallons.

2.8.9 Meter Boxes

Meter boxes shall be of cast iron or concrete. The boxes shall be of sufficient size to completely enclose the meter and shutoff valve or service stop. Meter boxes set in paved areas subject to vehicular traffic shall be cast iron, or concrete with cast iron lid and cast iron meter reader lid. Boxes set in sidewalks, not subject to vehicular traffic, shall use concrete covers with cast iron meter reader lids . Box height shall extend from invert of the meter to final grade at the meter location. The lid shall have the word "WATER" cast in it.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Cutting of Pipe

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practicable. Copper tubing shall be cut square and all burrs shall be removed. Squeeze type mechanical cutters shall not be used for ductile iron.

3.1.2 Adjacent Facilities

3.1.2.1 Sewer Lines

Where the location of the water pipe is not clearly defined in dimensions on the drawings, the water pipe shall not be laid closer horizontally than 10 feet from a sewer except where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, in which case the water pipe shall not be laid closer horizontally than 6 feet from the sewer. Where water lines cross under gravity-flow sewer lines, the sewer pipe, for a distance of at least 10 feet each side of the crossing, shall be fully encased in concrete or shall be made of pressure pipe with no joint located within 3 feet horizontally of the crossing. Water lines shall in all cases cross above sewage force mains or inverted siphons and shall be not less than 2 feet above the sewer main. Joints in the sewer main, closer horizontally than 3 feet to the crossing, shall be encased in concrete.

3.1.2.2 Water Lines

Water lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.

3.1.2.3 Copper Tubing Lines

Copper tubing shall not be installed in the same trench with ferrous piping materials.

3.1.2.4 Nonferrous Metallic Pipe

Where nonferrous metallic pipe, e.g. copper tubing, crosses any ferrous piping material, a minimum vertical separation of 12 inchesshall be maintained between pipes.

3.1.2.5 **[AM#3] DELETED**

3.1.3 Joint Deflection

3.1.3.1 Offset for Flexible Plastic Pipe

Maximum offset in alignment between adjacent pipe joints shall be as recommended by the manufacturer and approved by the Contracting Officer, but shall not exceed 5 degrees.

3.1.3.2 Allowable for Ductile-Iron Pipe

The maximum allowable deflection shall be as given in AWWA C600. If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

3.1.4 Placing and Laying

Install pipe and appurtenances in a coarse sand envelope, with the minimum thickness of the sand envelope being at least 6 inches. Pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other authorized equipment. Water-line materials shall not be dropped or dumped into the trench. Abrasion of the pipe

coating shall be avoided. Except where necessary in making connections with other lines or as authorized by the Contracting Officer, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, couplings, and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until joints are complete. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by and at the Contractor's expense in a satisfactory manner. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored, as shown.

3.1.4.1 Plastic Pipe Installation

PVC pipe shall be installed in accordance with AWWA M23.

3.1.4.2 Piping Connections

Where connections are made between new work and existing mains, the connections shall be made by using specials and fittings to suit the actual conditions. When made under pressure, these connections shall be installed using standard methods as approved by the Contracting Officer. Connections to existing asbestos-cement pipe shall be made in accordance with ACPPA 1344.

3.1.4.3 Penetrations

Pipe passing through walls of valve pits and structures shall be provided with ductile-iron or Schedule 40 steel wall sleeves. Annular space between walls and sleeves shall be filled with rich cement mortar. Annular space between pipe and sleeves shall be filled with mastic.

3.1.4.4 Flanged Pipe

Flanged pipe shall only be installed above ground or with the flanges in valve pits.

3.1.5 Jointing

3.1.5.1 PVC Plastic Pipe Requirements

a. Pipe less than 4 inch diameter: Threaded joints shall be made by wrapping the male threads with approved thread tape or applying an approved lubricant, then threading the joining members together. The joint shall be tightened using strap wrenches to prevent damage to the pipe and/or fitting. To avoid excessive torque, joints shall be tightened no more than one thread past hand-tight. Preformed rubber-ring gaskets for elastomeric-gasket joints shall be made in accordance with ASTM F 477 and as specified. Pipe ends for push-on joints shall be beveled to facilitate assembly and marked to indicate when the pipe is fully seated. The gasket shall be prelubricated to prevent displacement. The gasket and ring groove in the bell or coupling shall match. The manufacturer of the pipe or fitting shall supply the elastomeric gasket. Couplings shall be provided with stops or centering rings to

assure that the coupling is centered on the joint. Solvent cement joints shall use sockets conforming to ASTM D 2467. The solvent cement used shall meet the requirements of ASTM D 2564; the joint assembly shall be made in accordance with ASTM D 2855 and the manufacturer's specific recommendations.

b. Pipe 4 through 12 inch diameter: Joints shall be elastomeric gasket as specified in AWWA C900. Jointing procedure shall be as specified for pipe less than 4 inch diameter with configuration using elastomeric ring gasket.

c. Pipe 14 through 36 inch diameter: Joints shall be elastomeric gasket push-on joints made in accordance with AWWA M23.

3.1.5.2 Ductile-Iron Pipe Requirements

Mechanical and push-on type joints shall be installed in accordance with AWWA C600 for buried lines or AWWA C606 for grooved and shouldered pipe above ground or in pits.

3.1.5.3 Copper Tubing Requirements

Joints shall be made with flared fittings. The flared end tube shall be pulled tightly against the tapered part of the fitting by a nut which is part of the fitting, so there is metal-to-metal contact.

3.1.5.4 Bonded Joints Requirements

Bonded joints shall be installed in accordance with details specified for joints in paragraph JOINTS.

3.1.5.5 Isolation Joints and Dielectric Fittings

Isolation joints and dielectric fittings shall be installed in accordance with details specified in paragraph JOINTS. Dielectric unions shall be encapsulated in a field-poured coal-tar covering, with at least 1/8 inch thickness of coal tar over all fitting surfaces.

3.1.5.6 Transition Fittings

Connections between different types of pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

3.1.6 Installation of Service Lines

Service lines shall include the pipeline connecting building piping to water distribution lines to the connections with the building service at a point approximately 5 feet outside the building where such building service exists. All service stops and valves shall be provided with service boxes. Service lines shall be constructed in accordance with the following requirements:

3.1.6.1 Service Lines 50 mm (2 Inches) and Smaller

Service lines 2 inches and smaller shall be connected to the main by a directly-tapped corporation stop for ductile iron pipeor by a service clamp for PVC pipe. A corporation stop and a copper gooseneck shall be provided

with either type of connection. Maximum sizes for directly-tapped corporation stops and for outlets with service clamps shall be as in TABLE I. Where 2 or more gooseneck connections to the main are required for an individual service, such connections shall be made with standard branch connections. The total clear area of the branches shall be at least equal to the clear area of the service which they are to supply.

TABLE I. SIZE OF CORPORATION STOPS AND OUTLET

Pipe Size Inches	Corporation Stops, Inches For Ductile-Iron Pipe	Outlets w/Service Clamps, Inches Single & Double Strap
3	--	1
4	1	1
6	1-1/4	1-1/2
8	1-1/2	2
10	1-1/2	2
12 & larger	2	2

NOTE:

a. Service lines 1-1/2 inches and smaller shall have a service stop.

b. Service lines 2 inches in size shall have a gate valve.

3.1.6.2 Service Lines Larger than 50 mm (2 Inches)

Service lines larger than 2 inches shall be connected to the main by a tapped saddle, tapping sleeve and valve, service clamp or reducing tee, depending on the main diameter and the service line diameter, and shall have a gate valve.

3.1.6.3 Service Lines for Sprinkler Supplies

Water service lines used to supply building sprinkler systems for fire protection shall be connected to the water distribution main in accordance with NFPA 24.

3.1.7 Setting of Fire Hydrants, Valves and Valve Boxes

3.1.7.1 Location of Fire Hydrants

Fire hydrants shall be located and installed as shown. Each hydrant shall be connected to the main with a 6 inch branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with pumper nozzle facing the roadway, with the center of the lowest outlet not less than 18 inches above the finished surrounding grade, and the operating nut not more than 48 inches above the finished surrounding grade. Except where approved otherwise, the backfill around hydrants shall be thoroughly compacted to the finished grade immediately after installation to obtain

beneficial use of the hydrant as soon as practicable. The hydrant shall be set upon a slab of concrete not less than 4 inches thick and 15 inches square. Not less than 7 cubic feet of free-draining broken stone or gravel shall be placed around and beneath the waste opening of dry barrel hydrants to ensure drainage.

3.1.7.2 Location of Meters

Meters and meter boxes shall be installed at the locations shown on the drawings. The meters shall be centered in the boxes to allow for reading and ease of removal or maintenance.

3.1.7.3 Location of Valves

After delivery, valves, including those in hydrants, shall be drained to prevent freezing and shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and hydrants and valves shall be fully opened and fully closed to ensure that all parts are in working condition. Valves and valve boxes shall be installed where shown or specified, and shall be set plumb. Valve boxes shall be centered on the valves. Boxes shall be installed over each outside gate valve unless otherwise shown. Where feasible, valves shall be located outside the area of roads and streets. Earth fill shall be tamped around each valve box or pit to a distance of 4 feet on all sides of the box, or the undisturbed trench face if less than 4 feet.

3.1.7.4 Location of Service Boxes

Where water lines are located below paved streets having curbs, the boxes shall be installed directly back of the curbs. Where no curbing exists, service boxes shall be installed in accessible locations, beyond the limits of street surfacing, walks and driveways.

3.1.8 Tapped Tees and Crosses

Tapped tees and crosses for future connections shall be installed where shown.

3.1.9 Thrust Restraint

Plugs, caps, tees and bends deflecting 11.25 degrees or more, either vertically or horizontally, on waterlines 4 inches in diameter or larger, and fire hydrants shall be provided with thrust restraints. Valves shall be securely anchored or shall be provided with thrust restraints to prevent movement. Thrust restraints shall be either thrust blocks or, for ductile-iron pipes, restrained joints.

3.1.9.1 Thrust Blocks

Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 2,000 psi after 28 days. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting

joints will be accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

3.1.9.2 Restrained Joints

For ductile-iron pipe, restrained joints shall be designed by the Contractor or the pipe manufacturer in accordance with DIPRA TRD.

3.2 HYDROSTATIC TESTS

Where any section of a water line is provided with concrete thrust blocking for fittings or hydrants, the hydrostatic tests shall not be made until at least 5 days after installation of the concrete thrust blocking, unless otherwise approved.

3.2.1 Pressure Test

After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 200 psi. Water supply lines designated on the drawings shall be subjected for 1 hour to a hydrostatic pressure test of 200 psi. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Contracting Officer when one or more of the following conditions is encountered:

a. Wet or unstable soil conditions in the trench.

b. Compliance would require maintaining barricades and walkways around and across an open trench in a heavily used area that would require continuous surveillance to assure safe conditions.

c. Maintaining the trench in an open condition would delay completion of the project.

The Contractor may request a waiver, setting forth in writing the reasons for the request and stating the alternative procedure proposed to comply with the required hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.2.2 Leakage Test

Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to not less than 200 psi pressure. Water supply lines designated on the drawings shall be subjected to a pressure equal to 200 psi. Leakage is defined as

the quantity of water to be supplied into the newly laid pipe, or any valved or approved section, necessary to maintain pressure within 5 psi of the specified leakage test pressure after the pipe has been filled with water and the air expelled. Piping installation will not be accepted if leakage exceeds the allowable leakage which is determined by the following formula:

L = 0.0001351ND(P raised to 0.5 power)

L = Allowable leakage in gallons per hour
N = Number of joints in the length of pipeline tested
D = Nominal diameter of the pipe in inches
P = Average test pressure during the leakage test, in psi gauge

Should any test of pipe disclose leakage greater than that calculated by the above formula, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the Government.

3.2.3 Time for Making Test

Except for joint material setting or where concrete thrust blocks necessitate a 5-day delay, pipelines jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. Cement-mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

3.2.4 Concurrent Hydrostatic Tests

The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be as specified. Replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

a. Pressure test and leakage test may be conducted concurrently.

b. Hydrostatic tests and disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be reaccomplished.

3.3 BACTERIAL DISINFECTION

3.3.1 Bacteriological Disinfection

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as prescribed by AWWA C651. The disinfection shall be repeated until tests indicate the absence of pollution for at least 2 full days. The unit will not be accepted until satisfactory bacteriological results have been obtained.

3.4 **[AM#3] DISCHARGE OF WATER FROM HYDROSTATIC TESTS AND BACTERIAL**

DISINFECTION

Water wasted for testing and sterilization will be wasted as directed by the Contracting Officer in order of priority to:

1. Storm drains.

2. Ponding areas.

Or

3. Streets.

3.5 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

-- End of Section --

SECTION 02741A

HOT-MIX ASPHALT (HMA) FOR ROADS
09/99
AMMENDMENT NO. 0002 & 0003

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO TP53	(2000) Determining Asphalt Content of Hot Mix Asphalt by the Ignition Method

ASTM INTERNATIONAL (ASTM)

ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 1252	(1998) Uncompacted Void Content of Fine Aggregate (as Influenced by Particle Shape, Surface Texture, and Grading)
ASTM C 127	(2001) Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C 128	(2001) Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
ASTM C 131	(2001) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(2001) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 29/C 29M	(1997) Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C 566	(1997) Total Evaporable Moisture Content of Aggregate by Drying
ASTM C 88	(1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

ASTM D 140	(2001) Sampling Bituminous Materials
ASTM D 1461	(1985; R 2001) Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D 1559	(1989) Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D 2041	(2000) Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D 2172	(2001e1) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 2419	(2002) Sand Equivalent Value of Soils and Fine Aggregate
ASTM D 242	(1995; R 2000e1) Mineral Filler for Bituminous Paving Mixtures
ASTM D 2489	(2002) Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D 2726	(2000) Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D 2950	(1991; R 1997) Density of Bituminous Concrete in Place by Nuclear Method
ASTM D 3665	(1999) Random Sampling of Construction Materials
ASTM D 3666	(2002) Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D 4125	(1994;R 2000) Asphalt Content of Bituminous Mixtures by the Nuclear Method
ASTM D 4791	(1999) Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D 5444	(1998) Mechanical Size Analysis of Extracted Aggregate
ASTM D 6307	(1998) Asphalt Content of Hot Mix Asphalt by Ignition Method
ASTM D 946	(1982; R 1999) Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 995	(1995b; R 2002) Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving

Mixtures

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION (CDT)

CDT Test 526	(2002) Operation of California Profilograph and Evaluation of Profiles

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 171	(1995) Test Method for Determining Percentage of Crushed Particles in Aggregate

1.2 DESCRIPTION OF WORK

The work shall consist of pavement courses composed of mineral aggregate and asphalt material heated and mixed in a central mixing plant and placed on a prepared course. HMA designed and constructed in accordance with this section shall conform to the lines, grades, thicknesses, and typical cross sections shown on the drawings. Each course shall be constructed to the depth, section, or elevation required by the drawings and shall be rolled, finished, and approved before the placement of the next course.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Mix Design; G, RE.

Proposed JMF.

Contractor Quality Control; G; RE.

Quality control plan.

Material Acceptance ; G, RE.

Acceptance test results.

SD-06 Test Reports

Aggregates; G, RE.
QC Monitoring;

Aggregate and QC test results.

SD-07 Certificates

Asphalt Cement Binder; G, RE.

Copies of certified test data.

Testing Laboratory;

Certification of compliance.

1.4 ASPHALT MIXING PLANT

Plants used for the preparation of hot-mix asphalt shall conform to the requirements of ASTM D 995 with the following changes:

a. Truck Scales. The asphalt mixture shall be weighed on approved certified scales at the Contractor's expense. Scales shall be inspected and sealed at least annually by an approved calibration laboratory.

b. Testing Facilities. The Contractor shall provide laboratory facilities at the plant for the use of the Government's acceptance testing and the Contractor's quality control testing.

c. Inspection of Plant. The Contracting Officer shall have access at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant; verifying weights, proportions, and material properties; checking the temperatures maintained in the preparation of the mixtures and for taking samples. The Contractor shall provide assistance as requested, for the Government to procure any desired samples.

d. Storage Bins. Use of storage bins for temporary storage of hot-mix asphalt will be permitted as follows:

(1) The asphalt mixture may be stored in non-insulated storage bins for a period of time not exceeding 3 hours.

(2) The asphalt mixture may be stored in insulated storage bins for a period of time not exceeding 8 hours. The mix drawn from bins shall meet the same requirements as mix loaded directly into trucks.

1.5 HAULING EQUIPMENT

Trucks used for hauling hot-mix asphalt shall have tight, clean, and smooth metal beds. To prevent the mixture from adhering to them, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material. Petroleum based products shall not be used as a release agent. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers (tarps) shall be securely fastened.

1.6 ASPHALT PAVERS

Asphalt pavers shall be self-propelled, with an activated screed, heated as necessary, and shall be capable of spreading and finishing courses of hot-mix asphalt which will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

1.6.1 Receiving Hopper

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

1.6.2 Automatic Grade Controls

If an automatic grade control device is used, the paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices which will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent. A transverse slope controller shall not be used to control grade. The controls shall be capable of working in conjunction with any of the following attachments:

a. Ski-type device of not less than 30 feet in length.

b. Taut stringline set to grade.

c. Short ski or shoe for joint matching.

d. Laser control.

1.7 ROLLERS

Rollers shall be in good condition and shall be operated at slow speeds to avoid displacement of the asphalt mixture. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Equipment which causes excessive crushing of the aggregate shall not be used.

1.8 WEATHER LIMITATIONS

The hot-mix asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 1. The temperature requirements may be waived by the Contracting Officer, if requested; however, all other requirements, including compaction, shall be met.

Table 1. Surface Temperature Limitations of Underlying Course

Mat Thickness, inches	Degrees F
3 or greater	40
Less than 3	45

PART 2 PRODUCTS

2.1 AGGREGATES

Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The portion of material retained on the No. 4 sieve is coarse aggregate. The portion of material passing the No. 4 sieve and retained on the No. 200 sieve is fine aggregate. The portion passing the No. 200 sieve is defined as mineral filler. All aggregate test results and samples shall be submitted to the Contracting Officer at least 14 days prior to start of construction.

2.1.1 Coarse Aggregate

Coarse aggregate shall consist of sound, tough, durable particles, free from films of material that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. All individual coarse aggregate sources shall meet the following requirements:

a. The percentage of loss shall not be greater than 40 percent after 500 revolutions when tested in accordance with ASTM C 131.

b. The percentage of loss shall not be greater than 18 percent after five cycles when tested in accordance with ASTM C 88 using magnesium sulfate .

c. At least 75 percent by weight of coarse aggregate shall have at least two or more fractured faces when tested in accordance with COE CRD-C 171. Fractured faces shall be produced by crushing.

d. The particle shape shall be essentially cubical and the aggregate shall not contain more than 20% percent, by weight, of flat and elongated particles (3:1 ratio of maximum to minimum) when tested in accordance with ASTM D 4791.

e. Slag shall be air-cooled, blast furnace slag, and shall have a compacted weight of not less than 75 lb/cu ft when tested in accordance with ASTM C 29/C 29M.

2.1.2 Fine Aggregate

Fine aggregate shall consist of clean, sound, tough, durable particles. The aggregate particles shall be free from coatings of clay, silt, or any objectionable material and shall contain no clay balls. All individual fine aggregate sources shall have a sand equivalent value not less than 45 when tested in accordance with ASTM D 2419.

The fine aggregate portion of the blended aggregate shall have an uncompacted void content not less than 43.0 percent when tested in accordance with ASTM C 1252 Method A.

2.1.3 Mineral Filler

Mineral filler shall be nonplastic material meeting the requirements of ASTM D 242.

2.1.4 Aggregate Gradation

The combined aggregate gradation shall conform to gradations specified in Table 2, when tested in accordance with ASTM C 136 and ASTM C 117, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa, but grade uniformly from coarse to fine.

Table 2. Aggregate Gradations

Sieve Size, inch	Gradation 1 Percent Passing by Mass	Gradation 2 Percent Passing by Mass	Gradation 3 Percent Passing by Mass
1	100	---	---
3/4	76-96	100	---
1/2	68-88	76-96	100
3/8	60-82	69-89	76-96
No. 4	45-67	53-73	58-78
No. 8	32-54	38-60	40-60
No. 16	22-44	26-48	28-48
No. 30	15-35	18-38	18-38
No. 50	9-25	11-27	11-27
No. 100	6-18	6-18	6-18
No. 200	3-6	3-6	3-6

2.2 ASPHALT CEMENT BINDER

Asphalt cement binder shall conform to ASTM D 946 penetration grade AC20. Test data indicating grade certification shall be provided by the supplier at the time of delivery of each load to the mix plant. Copies of these certifications shall be submitted to the Contracting Officer. The supplier is defined as the last source of any modification to the binder. The Contracting Officer may sample and test the binder at the mix plant at any time before or during mix production. Samples for this verification testing shall be obtained by the Contractor in accordance with ASTM D 140 and in the presence of the Contracting Officer. These samples shall be furnished to the Contracting Officer for the verification testing, which shall be at no cost to the Contractor. Samples of the asphalt cement specified shall be submitted for approval not less than 14 days before start of the test section.

2.3 MIX DESIGN

HOTMIX SURFACE COURSE shall conform to the requirements of NMSHTD-01 for "Plant Mix Bituminous Pavement (PMBP)," Section 401, Type I, gradation B, except as specified hereinafter; or shall conform to the requirements of TSDHPT-01 for "Hot-Mix Asphaltic Concrete Pavement (Class A)," Item 340, paving mixture type "D", except as specified hereinafter.

2.3.1 State Specification Modifications

TSDHPT Specification shall be modified as follows:

(a) Material retained on the No. 10 screen shall not exceed 65 percent.

(b) Density and stability requirements shall not apply.

(c) Construction methods paragraph shall not apply.

(d) The measurement and payment paragraphs shall not apply.

New Mexico State Highway and Transportation Department Standard Specification shall be modified as follows:

(a) Material retained on the No. 10 screen shall not exceed 65 percent.

(b) Density and stability requirements shall not apply.

(c) Construction methods paragraph shall not apply.

(d) The measurement and payment paragraphs shall not apply.

2.4 PROPORTIONING OF MIXTURE

2.4.1 Job Mix Formula (JMF)

The JMF for the bituminous mixture will be furnished to the Contracting Officer for approval. No payment will be made for mixtures produced prior to the approval of the JMF. The formula will indicate the percentage of each stockpile and mineral filler, the percentage of each size aggregate, the percentage of bitumen, and the temperature of the completed mixture when discharged from the mixer. The tolerances specified in the NMSHTD-01, Section 401, or TSDHPT-01, Item 340, will be allowed (as applicable) for asphalt content, temperature, and aggregate grading for tests conducted on the mix as discharged from the mixing plant. Bituminous mix that deviates more than 25 degrees F. from the JMF shall be rejected. The JMF may be adjusted during construction to improve paving mixtures, as directed, without adjustments in the contract prices.

2.4.2 Test Properties of Bituminous Mixtures

Finished mixture shall meet requirements described below when tested in accordance with **[AM#2]** **ASTM D 4125**. All samples will be compacted with 50 blows of specified hammer on each side of sample. When bituminous mixture fails to meet the requirements specified below, the paving operation shall be stopped until the cause of noncompliance is determined and corrected.

2.4.2.1 Stability, Flow, and Voids

Requirements for stability, flow, and voids are shown in TABLES I and II for nonabsorptive and absorptive aggregates, respectively.

TABLES I and II - Not Used.

TABLE III. NONABSORPTIVE-AGGREGATE MIXTURE

	Intermediate Wearing Course	Course
Stability minimum, pounds	500	500
Flow maximum, 1/100-inch units	20	20
Voids total mix, percent (1)	3-5	4-6

Voids filled with bitumen, percent (2)	75-85	65-75

(1) The Contracting Officer may permit deviations from limits specified when gyratory method of design is used to develop the JMF.

(2) The Contracting Officer may permit deviation from limits specified for voids filled with bitumen in the intermediate course in order to stay within limits for percent voids total mix.

TABLE IV. ABSORPTIVE-AGGREGATE MIXTURE

	Intermediate Wearing Course	Course
Stability minimum, pounds	500	500
Flow maximum, 1/100-inch units	20	20
Voids total mix, percent (1)	2-4	3-5
Voids filled with bitumen, percent (2)	80-90	70-80

(1) The Contracting Officer may permit deviations from limits specified when gyratory method of design is used to develop the JMF.

(2) The Contracting Officer may permit deviation from limits specified for voids filled with bitumen in the intermediate course in order to stay within limits for percent voids total mix.

a. When the water-absorption value of the entire blend of aggregate does not exceed 2.5 percent as determined in accordance with ASTM C 127 and ASTM C 128, the aggregate is designated as nonabsorptive. The theoretical specific gravity computed from the apparent specific gravity or ASTM D 2041 will be used in computing voids total mix and voids filled with bitumen, and the mixture shall meet requirements in TABLE I.

b. When the water-absorption value of the entire blend of aggregate exceeds 2.5 percent as determined in accordance with ASTM C 127 and "ASTM C 128, the aggregate is designated as absorptive. The theoretical specific gravity computed from the bulk-impregnated specific gravity method contained in **[AM#2]** _____ ASTM D 2041 shall be used in computing percentages of voids total mix and voids filled with bitumen; the mixture shall meet requirements in TABLE II.

PART 3 EXECUTION

3.1 PREPARATION OF ASPHALT BINDER MATERIAL

The asphalt cement material shall be heated avoiding local overheating and providing a continuous supply of the asphalt material to the mixer at a uniform temperature. The temperature of unmodified asphalts shall be no more than 325 degrees F when added to the aggregates. Modified asphalts shall be no more than 350 degrees F when added to the aggregates.

3.2 PREPARATION OF MINERAL AGGREGATE

The aggregate for the mixture shall be heated and dried prior to mixing. No damage shall occur to the aggregates due to the maximum temperature and rate of heating used. The temperature of the aggregate and mineral filler shall not exceed 350 degrees F when the asphalt cement is added. The

temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

3.3 PREPARATION OF HOT-MIX ASPHALT MIXTURE

The aggregates and the asphalt cement shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but no less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D 2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to at least achieve 95 percent of coated particles. The moisture content of all hot-mix asphalt upon discharge from the plant shall not exceed 0.5 percent by total weight of mixture as measured by ASTM D 1461.

3.4 PREPARATION OF THE UNDERLYING SURFACE

Immediately before placing the hot mix asphalt, the underlying course shall be cleaned of dust and debris. A prime coat and/or tack coat shall be applied in accordance with the contract specifications.

3.5 TEST SECTION

Prior to full production, the Contractor shall place a test section for each JMF used. The contractor shall construct a test section 250 - 500 feet long. The test section shall be of the same depth as the course which it represents. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment and personnel used in construction of the test section shall be the same equipment to be used on the remainder of the course represented by the test section. The test section shall be placed as part of the project pavement as approved by the Contracting Officer.

3.5.1 Sampling and Testing for Test Section

One random sample shall be taken at the plant, triplicate specimens compacted, and tested for stability, flow, and laboratory air voids. A portion of the same sample shall be tested for aggregate gradation and asphalt content. Four randomly selected cores shall be taken from the finished pavement mat, and four from the longitudinal joint, and tested for density. Random sampling shall be in accordance with procedures contained in ASTM D 3665. The test results shall be within the tolerances shown in Table 5 for work to continue. If all test results meet the specified requirements, the test section shall remain as part of the project pavement. If test results exceed the tolerances shown, the test section shall be removed and replaced at no cost to the Government and another test section shall be constructed. The test section shall be paid for with the first lot of paving

Table 5. Test Section Requirements for Material and Mixture Properties

Property	Specification Limit
Aggregate Gradation-Percent Passing (Individual Test Result)	
No. 4 and larger	JMF plus or minus 8
No. 8, No. 16, No. 30, and No. 50	JMF plus or minus 6
No. 100 and No. 200	JMF plus or minus 2.0
Asphalt Content, Percent (Individual Test Result)	JMF plus or minus 0.5
Laboratory Air Voids, Percent (Average of 3 specimens)	JMF plus or minus 1.0
VMA, Percent (Average of 3 specimens)	14 minimum
Stability, pounds (Average of 3 specimens)	1000 minimum
Flow, 0.01 inches (Average of 3 specimens)	8 - 16
Mat Density, Percent of Marshall (Average of 4 Random Cores)	97.0 - 100.5
Joint Density, Percent of Marshall (Average of 4 Random Cores)	95.5 - 100.5

3.5.2 Additional Test Sections

If the initial test section should prove to be unacceptable, the necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made. A second test section shall then be placed. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Full production shall not begin until an acceptable section has been constructed and accepted.

3.6 TESTING LABORATORY

The laboratory used to develop the JMF shall meet the requirements of ASTM D 3666. A certification signed by the manager of the laboratory stating that it meets these requirements or clearly listing all deficiencies shall be submitted to the Contracting Officer prior to the start of construction. The certification shall contain as a minimum:

a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.

b. A listing of equipment to be used in developing the job mix.

c. A copy of the laboratory's quality control system.

d. Evidence of participation in the AASHTO Materials Reference

Laboratory (AMRL) program.

3.7 TRANSPORTING AND PLACING

3.7.1 Transporting

The hot-mix asphalt shall be transported from the mixing plant to the site in clean, tight vehicles. Deliveries shall be scheduled so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver. Adequate artificial lighting shall be provided for night placements. Hauling over freshly placed material will not be permitted until the material has been compacted as specified, and allowed to cool to 140 degrees F. To deliver mix to the paver, the Contractor shall use a material transfer vehicle which shall be operated to produce continuous forward motion of the paver.

3.7.2 Placing

The mix shall be placed and compacted at a temperature suitable for obtaining density, surface smoothness, and other specified requirements. Upon arrival, the mixture shall be placed to the full width by an asphalt paver; it shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Unless otherwise permitted, placement of the mixture shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The mixture shall be placed in consecutive adjacent strips having a minimum width of 10 feet. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1 foot; however, the joint in the surface course shall be at the centerline of the pavement. Transverse joints in one course shall be offset by at least 10 feet from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet. On isolated areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools.

3.8 COMPACTION OF MIXTURE

After placing, the mixture shall be thoroughly and uniformly compacted by rolling. The surface shall be compacted as soon as possible without causing displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once. Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened but excessive water will not be permitted. In areas not accessible to the roller, the mixture shall be thoroughly compacted with hand tampers. Any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or is in any way defective shall be removed full depth, replaced with fresh hot mixture and immediately

compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching will not be allowed.

3.9 JOINTS

The formation of joints shall be made ensuring a continuous bond between the courses and to obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

3.9.1 Transverse Joints

The roller shall not pass over the unprotected end of the freshly laid mixture, except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing material at the joint . The cutback material shall be removed from the project. In both methods, all contact surfaces shall be given a light tack coat of asphalt material before placing any fresh mixture against the joint.

3.9.2 Longitudinal Joints

Longitudinal joints which are irregular, damaged, uncompacted, cold (less than 175 degrees F at the time of placing adjacent lanes), or otherwise defective, shall be cut back a minimum of 2 inches from the edge with a cutting wheel to expose a clean, sound vertical surface for the full depth of the course. All cutback material shall be removed from the project. All contact surfaces shall be given a light tack coat of asphalt material prior to placing any fresh mixture against the joint. The Contractor will be allowed to use an alternate method if it can be demonstrated that density, smoothness, and texture can be met.

3.10 CONTRACTOR QUALITY CONTROL

3.10.1 General Quality Control Requirements

The Contractor shall develop an approved Quality Control Plan. Hot-mix asphalt for payment shall not be produced until the quality control plan has been approved. The plan shall address all elements which affect the quality of the pavement including, but not limited to:

a. Mix Design

b. Aggregate Grading

c. Quality of Materials

d. Stockpile Management

e. Proportioning

f. Mixing and Transportation

g. Mixture Volumetrics

h. Moisture Content of Mixtures

i. Placing and Finishing

j. Joints

k. Compaction

l.Surface Smoothness

3.10.2 Testing Laboratory

The Contractor shall provide a fully equipped asphalt laboratory located at the plant or job site. The laboratory shall meet the requirements as required in ASTM D 3666. The effective working area of the laboratory shall be a minimum of 150 square feet with a ceiling height of not less than 7.5 feet. Lighting shall be adequate to illuminate all working areas. It shall be equipped with heating and air conditioning units to maintain a temperature of 75 degrees F plus or minus 5 degrees F. Laboratory facilities shall be kept clean and all equipment shall be maintained in proper working condition. The Contracting Officer shall be permitted unrestricted access to inspect the Contractor's laboratory facility, to witness quality control activities, and to perform any check testing desired. The Contracting Officer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to adversely affect test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are corrected.

3.10.3 Quality Control Testing

The Contractor shall perform all quality control tests applicable to these specifications and as set forth in the Quality Control Program. The testing program shall include, but shall not be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, moisture in the asphalt mixture, laboratory air voids, stability, flow, in-place density, grade and smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

3.10.3.1 Asphalt Content

A minimum of two tests to determine asphalt content will be performed per lot (a lot is defined in paragraph MATERIAL ACCEPTANCE) by one of the following methods: the extraction method in accordance with ASTM D 2172, Method A or B, the ignition method in accordance with the AASHTO TP53or ASTM D 6307, or the nuclear method in accordance with ASTM D 4125, provided the nuclear gauge is calibrated for the specific mix being used. For the extraction method, the weight of ash, as described in ASTM D 2172, shall be determined as part of the first extraction test performed at the beginning of plant production; and as part of every tenth extraction test performed thereafter, for the duration of plant production. The last weight of ash value obtained shall be used in the calculation of the asphalt content for the mixture.

3.10.3.2 Gradation

Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of recovered aggregate in accordance with ASTM D 5444. When asphalt content is determined by the nuclear method, aggregate gradation shall be determined from hot bin samples on batch plants, or from the cold feed on drum mix plants. For batch plants, aggregates shall be tested in accordance with ASTM C 136 using actual batch weights to determine the combined aggregate gradation of the mixture.

3.10.3.3 Temperatures

Temperatures shall be checked at least four times per lot, at necessary locations, to determine the temperature at the dryer, the asphalt cement in the storage tank, the asphalt mixture at the plant, and the asphalt mixture at the job site.

3.10.3.4 Aggregate Moisture

The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C 566.

3.10.3.5 Moisture Content of Mixture

The moisture content of the mixture shall be determined at least once per lot in accordance with ASTM D 1461 or an approved alternate procedure.

3.10.3.6 Laboratory Air Voids, Marshall Stability and Flow

Mixture samples shall be taken at least four times per lot and compacted into specimens, using 50 blows per side with the Marshall hammer as described in ASTM D 1559. After compaction, the laboratory air voids of each specimen shall be determined, as well as the Marshall stability and flow.

3.10.3.7 In-Place Density

The Contractor shall conduct any necessary testing to ensure the specified density is achieved. A nuclear gauge may be used to monitor pavement density in accordance with ASTM D 2950.

3.10.3.8 Grade and Smoothness

The Contractor shall conduct the necessary checks to ensure the grade and smoothness requirements are met in accordance with paragraph MATERIAL ACCEPTANCE.

3.10.3.9 Additional Testing

Any additional testing, which the Contractor deems necessary to control the process, may be performed at the Contractor's option.

3.10.3.10 QC Monitoring

The Contractor shall submit all QC test results to the Contracting Officer on a daily basis as the tests are performed. The Contracting Officer reserves the right to monitor any of the Contractor's quality control testing and to perform duplicate testing as a check to the Contractor's quality control testing.

3.10.4 Sampling

When directed by the Contracting Officer, the Contractor shall sample and test any material which appears inconsistent with similar material being produced, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

3.11 MATERIAL ACCEPTANCE

Testing for acceptability of work will be performed by an independent laboratory hired by the Contractor. Test results shall be forwarded daily to the Contracting Officer. Acceptance of the plant produced mix and in-place requirements will be on a lot to lot basis. A standard lot for all requirements will be equal to 4 hours of production. Grade and surface smoothness determinations will be made on the lot as a whole. Exceptions or adjustments to this will be made in situations where the mix within one lot is placed as part of both the intermediate and surface courses, thus grade and smoothness measurements for the entire lot cannot be made. In order to evaluate laboratory air voids and in-place (field) density, each lot will be divided into four equal sublots. When a lot of material fails to meet the specification requirements for the test sections, that lot shall be removed and replaced.

3.11.1 Sublot Sampling

One random mixture sample for determining laboratory air voids, theoretical maximum density, and for any additional testing the Contracting Officer desires, will be taken from a loaded truck delivering mixture to each sublot, or other appropriate location for each sublot. All samples will be selected randomly, using commonly recognized methods of assuring randomness conforming to ASTM D 3665 and employing tables of random numbers or computer programs. Laboratory air voids will be determined from three laboratory compacted specimens of each sublot sample in accordance with ASTM D 1559. The specimens will be compacted within 2 hours of the time the mixture was loaded into trucks at the asphalt plant. Samples will not be reheated prior to compaction and insulated containers will be used as necessary to maintain the temperature.

3.11.2 Additional Sampling and Testing

The Contracting Officer reserves the right to direct additional samples and tests for any area which appears to deviate from the specification requirements. The cost of any additional testing will be paid for by the Government. Testing in these areas will be in addition to the lot testing, and the requirements for these areas will be the same as those for a lot.

3.11.3 Laboratory Air Voids

Laboratory air voids will be calculated by determining the Marshall density of each lab compacted specimen using ASTM D 2726 and determining the theoretical maximum density of every other sublot sample using ASTM D 2041. Laboratory air void calculations for each sublot will use the latest theoretical maximum density values obtained, either for that sublot or the previous sublot.

3.11.4 In-place Density

3.11.4.1 General Density Requirements

For determining in-place density, one random core will be taken by the Government from the mat (interior of the lane) of each sublot, and one random core will be taken from the joint (immediately over joint) of each sublot. Each random core will be full thickness of the layer being placed. When the random core is less than 1 inch thick, it will not be included in the analysis. In this case, another random core will be taken. After air drying to a constant weight, cores obtained from the mat and from the joints will be used for in-place density determination.

3.11.4.2 Mat and Joint Densities

The average in-place mat and joint densities are expressed as a percentage of the average Marshall density for the lot. The Marshall density for each lot will be determined as the average Marshall density of the four random samples (3 specimens compacted per sample). The average in-place mat density and joint density for a lot are determined and compared with Table 5.

3.11.5 Grade

The final wearing surface of pavement shall conform to the elevations and cross sections shown and shall vary not more than 0.05 foot from the plan grade established and approved at site of work. Finished surfaces at juncture with other pavements shall coincide with finished surfaces of abutting pavements. Deviation from the plan elevation will not be permitted in areas of pavements where closer conformance with planned elevation is required for the proper functioning of drainage and other appurtenant structures involved. The final wearing surface of the pavement will be tested for conformance with specified plan grade requirements. The grade will be determined by running lines of levels at intervals of 25 feet, or less, longitudinally and transversely, to determine the elevation of the completed pavement surface. Within 5 working days, after the completion of a particular lot incorporating the final wearing surface, the Contracting Officer will inform the Contractor in writing, of the results of the grade-conformance tests. When more than 10 percent of all measurements made within a lot are outside the 0.05 foot tolerance, the Contractor shall remove the surface lift full depth; the Contractor shall then replace the lift with hot-mix asphalt to meet specification requirements, at no additional cost to the Government. Diamond grinding may be used to remove high spots to meet grade requirements. Skin patching for correcting low areas or planing or milling for correcting high areas will not be permitted.

3.11.6 Surface Smoothness

The Contractor shall use one of the following methods to test and evaluate surface smoothness of the pavement. All testing shall be performed in the presence of the Contracting Officer. Detailed notes of the results of the testing shall be kept and a copy furnished to the Government immediately after each day's testing. **[AM#3] (_____.)** Where drawings show required deviations from a plane surface (crowns, drainage inlets, etc.), the surface shall be finished to meet the approval of the Contracting Officer.

3.11.6.1 Smoothness Requirements

a. Straightedge Testing: The finished surfaces of the pavements shall have no abrupt change of 1/4 inch or more, and all pavements shall be within the tolerances specified in Table 9 when checked with an approved 12 foot straightedge.

Table 9. Straightedge Surface Smoothness--Pavements

Pavement Category	Direction of Testing	Tolerance, inches
All paved areas	Longitudinal	1/4
	Transverse	1/4

[AM#3] (_____.)

Table 10. **[AM#3] DELETED**

3.11.6.2 Testing Method

After the final rolling, but not later than 24 hours after placement, the surface of the pavement in each entire lot shall be tested by the Contractor in such a manner as to reveal all surface irregularities exceeding the tolerances specified above. Separate testing of individual sublots is not required. If any pavement areas are ground, these areas shall be retested immediately after grinding. The entire area of the pavement shall be tested in both a longitudinal and a transverse direction on parallel lines. The transverse lines shall be 25 feet or less apart, as directed. The longitudinal lines shall be at the centerline of each paving lane for lines less than 20 feet and at the third points for lanes 20 feet or greater. Other areas having obvious deviations shall also be tested. Longitudinal testing lines shall be continuous across all joints.

a. Straightedge Testing. The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points.

[AM#3] DELETED

3.11.6.3 Smoothness Acceptance

a. Straightedge Testing. Location and deviation from straightedge for all measurements shall be recorded. When more than 10.0 percent of all measurements exceed the tolerance, the lot shall be removed and replaced at no additional cost to the Government. Regardless of the above, any small individual area with surface deviation which exceeds the tolerance given above by more than 50 percent, shall be corrected by diamond grinding to meet the specification requirements above or shall be removed and replaced at no additional cost to the Government.

[AM#3] DELETED

c. Bumps ("Must Grind" Areas). Any bumps ("must grind" areas) **[AM#3]** _____ which exceed 0.4 inch in height shall be reduced by diamond grinding until they do not exceed 0.3 inch when retested. Such grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. The following will not be permitted: (1) skin patching for correcting low areas, (2) planing or milling for correcting high areas. At the Contractor's option, pavement areas, including ground areas, may be rechecked **[AM#3]** _____ in order to record a lower Profile Index.

-- End of Section --

SECTION 11241A

CHLORINE-FEEDING MACHINES (SEMIAUTOMATIC)
12/88
AMENDMENT NO. 0003

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.

ASME INTERNATIONAL (ASME)

ASME B16.1	(1998) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.11	(2002) Forged Fittings, Socket-Welding and Threaded
ASME B16.3	(1998) Malleable Iron Threaded Fittings
ASME B16.5	(1996) Pipe Flanges and Flanged Fittings

ASTM INTERNATIONAL (ASTM)

ASTM A 53	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM B 88	(2002) Seamless Copper Water Tube
ASTM B 88M	(1999) Seamless Copper Water Tube (Metric)
ASTM D 1785	(1999) Poly(Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM F 441/F 441M	(1999e1) Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80

CHLORINE INSTITUTE (CI)

CI Pamphlet 1	(1997) Chlorine Manual
CI Pamphlet 6	(1998) Piping Systems for Dry Chlorine

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

30 CFR 72	Health Standards for Coal Mines

1.2 GENERAL REQUIREMENTS

1.2.1 Standard Products

Material 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. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

1.2.2 Nameplates

Major equipment items shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

1.2.3 Verification of Dimensions

After becoming familiar with all details of work, the Contractor shall verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation;

Detail drawings containing complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-03 Product Data

Chlorine-Feeding System;

A complete list of equipment and material, including manufacturer's descriptive data and technical literature, performance charts and curves, catalog cuts, and installation instructions. Spare parts data for each different item of material and equipment specified, after approval of the detail drawings and not later than 6 months prior to the date of beneficial occupancy. Data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 1 and 3 years of service.

Diagrams, instructions, and other sheets, proposed for posting.

SD-06 Test Reports

Testing;

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-10 Operation and Maintenance Data

Chlorine-Feeding System;

Six complete copies of operating manuals outlining the step-by-step procedures required for system startup, operation and shutdown. The manuals shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six complete copies of maintenance manuals listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall include gas pipe layout, liquid chlorine pipe layout, dilution liquid pipe layout, equipment layout, and simplified wiring and control diagrams of the system as installed.

1.4 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt and dust, or other contaminants.

1.5 MAINTENANCE, EXTRA MATERIALS AND TOOLS

1.5.1 Auxiliary Equipment and Spare Parts

Auxiliary equipment and spare parts shall be furnished as follows:

a. One spare flow rate indicator for each machine.

b. One flexible tank connection for each machine, except where the machine is direct cylinder-mounted.

c. Three each of all special gaskets to fit all joints and unions.

d. One set of all necessary hose clamps to suit all hose connections.

e. Fifty cylinder valve gaskets.

f. One 4 ounce bottle of ammonia.

g. Stationary metal platform scale without wheels, with a capacity of 2 chloride containers of 150 pounds size and of the dial type.

h. 2 air-purifying respirators, with cartridges conforming to 30 CFR 72; Subpart 710. 1 self-contained air breathing units.

i. 1 residual-chlorine comparator of a type employing permanent color

standards and 13- or 26-millimeter viewing-depth sample tubes, with corrosion-resistant case, a color disk reading from 0.0 mg/L to 4 mg/L, and sufficient DPD tablets for 100 tests. The residual chlorine comparators shall meet EPA requirements.

j. 2 emergency repair kit for chlorine cylinders.

1.5.2 Special Tools

For each type of equipment furnished provide:

a. Special tools necessary for adjustment, operation, maintenance, and disassembly.

b. A grease gun or other lubricating device for each type of grease required.

c. One or more steel cases mounted on the wall complete with flat key locks, two keys, and clips or hooks to hold each tool in a convenient location. Tools shall be high-grade, smooth, forged, alloy tool steel. Grease guns shall be lever type. Tools shall be delivered at the same time as the equipment and handed over on completion of the work.

PART 2 PRODUCTS

2.1 CHLORINE-FEEDING MACHINE

The machine at 1318 shall be designed for the treatment of water by the application of chlorine gas against a positive head of 30 feet using the facility's water supply system for operation of the machines under a variation in pressure from 10 (minimum) to 40 maximum psi. See plans for the reuse of some equipment at 1318 Chlorine Building. The chlorine-feeding system shall consist of controls and devices necessary for a complete operating system including a chlorine pressure gauge or other device that indicates loss of chlorine pressure, a chlorine pressure-reducing valve, a meter with rate-of-flow, injector, pressure-relief valves, water-pressure gauges, water strainers, backflow preventer and water-pressure regulator if required. Each chlorine-feeding machine shall be provided with means for wall mounting and shall be designed so that the chlorine gas feed rate control is under a vacuum when the machine is in operation. Chlorine gas shall be mixed with liquid after being measured through the meter. The chlorine feeding machine shall function accurately regardless of normal variations in pressure in the chlorine cylinders . In case of failure of the chlorine supply, the machine shall be the type that is automatically protected against flooding or damage so that under operating conditions it will not be possible for water to get back into the chlorine inlet line or dry-gas control parts. Parts subject to contact with chlorine shall be made of materials resistant to the action of chlorine at the pressures and concentrations that could be encountered. Construction shall be as simple as practicable to provide reliable service and to be readily accessible for inspection, cleaning, adjustment, repairs, and replacements.

2.1.1 Capacity

Each chlorine-feeding machine shall be capable of delivering chlorine from a minimum of 100 pounds to a maximum of 200 pounds at 1318, in 24 hours and shall be capable of continuous operation at rated capacity.

2.1.2 Chlorinator Controls

Each chlorine-feeding machine shall be of the fully automatic semiautomatic type. Fully automatic machines shall be capable of receiving standard 4-20 mA control signals. New fully automatic controls at 1318shall consist of devices with accessories to adjust continuously the rate of chlorine feed automatically in direct proportion to chlorine residual to compensate for changes in the chlorine demand of the water being chlorinated. The controls shall require no manual attention other than adjustment of the required chlorine residual. Semiautomatic controls shall consist of devices with accessories to start and stop the chlorine-feeding machine automatically with the starting and stopping of the water being chlorinated or with a timer mechanism. Program control shall consist of a device with accessories to change the chlorine feed rate of the machine automatically according to a predetermined cycle.

2.1.3 Cylinder Connections

Cylinder connections shall be provided for attaching standard chlorine cylinders to the chlorine-feeding machines. Connections shall include flexible metal tubing, an auxiliary valve for each chlorine cylinder, a manifold for connecting 4 cylinders to each chlorine-feeding machine, and other necessary fittings, unless the machine is direct cylinder-mounted.

2.1.4 Switchover Valves

Two or more mechanically operated or loss of chlorine supply-operated automatic gas switchover valves to automatically regulate chlorine gas vacuum shall be supplied and installed in the gas header . The switchover valves shall be of suitable size and shall be equipped with filters . The switchover vacuum shall be factory set.

2.1.5 Chlorine Pressure Gauges

Chlorine pressure gauges when supplied, shall be of the diaphragm type with the Bourdon tube and diaphragm compartments filled completely with suitable oil. The gauge on the line from the chlorine tank shall be constructed to indicate accurately the pressure of chlorine gas as supplied from the gas tank to the chlorine feeder.

2.1.6 Chlorine Pressure-Reducing Valves

Chlorine pressure-reducing valves shall function to reduce the pressure of the gas and maintain the pressure constant for any given setting of rate of feed regardless of changes in the cylinder pressure.

2.1.7 Vacuum and Chlorine Relief

Vacuum and chlorine relief shall be provided to limit the vacuum within the chlorine-feeding machines and provide for the release to a suitable vent to the outside atmosphere of any chlorine gas pressure build-up in the parts of the machine, normally under vacuum, through improper functioning of the equipment. A vacuum sealing valve which will seal off the system when

excessive vacuum is present may be substituted for the vacuum relief valve.

2.1.8 Chlorine-Metering Devices

Chlorine-metering devices in sufficient number shall be furnished to cover properly the range specified. The chlorine feed rate control system shall maintain the feed rate within 4 percent of the indicated rate.

2.1.9 Injectors

Injectors shall be provided with the chlorine-feeding machines to receive all chlorine and solution water and to discharge the resulting solution to the points of application. At Area A - Building 1318, the existing injector shall be reused. At Area C - Building 11172, a new injector shall be installed with valve box as shown on the plans. The chlorine solution shall be introduced into the water main or tanks by means of a hard rubber or plastic injection nozzle of a suitable diffuser tube inserted into the main through a corporation cock.

2.1.10 Alarm Actuators

Each chlorine-feeding machine shall be equipped with alarm actuators to indicate loss of vacuum and excess vacuum. Alarm actuators shall be provided for low chlorine gas pressure and high chlorine gas pressure, unless the chlorine-feeding machine is direct-cylinder mounted. There shall also be a solution water low pressure alarm actuator.

2.1.11 Ejector Nozzles

The three chlorine ejectors/check valves assemblies at Tobin Wells shall be capable of each feeding 100 lbs per day of chlorine. These three-ejectors/check valve assemblies shall be valved and piped as shown on the Drawings, to feed the three storage tanks with chlorine solution with additional valving from the ejectors to feed the 16" tank bypass line.

The four chlorine ejectors/check valves assemblies at Building 1318 shall be capable of each feeding 50 lbs per day of chlorine. All of the ejectors shall have a 3/8-inch vacuum connection. Automatic controls shall be installed in front of the four rotometers and ejecotrs for complete SCADA control.

The following spare parts shall be provided at each of the 1318 and Tobin Wells chlorine feed locations.

1. One (1) set ejector diaphragms.
2. One (1) set ejector gaskets.
3. One (1) wall mount bracket.

2.1.12 Scales, Cylinder

A. The chlorine gas cylinder scales shall consist of a dual platform-weighing base with a weight indicator mounted on a support column. The scale shall be of the electronic strain gauge, load cell type equipped with two separate weighing platforms and built-in stops.

B. The support column shall be pre-drilled for mounting an automatic switchover module.

C. Each platform shall have a gross weight capacity of 0-350 pounds, and a tare weight capacity of 180 pounds and an independent tare weight adjustment. The scale shall use eight (8) strain gauges per platform to compensate for off-center cylinder placement with no loss of accuracy.

D. Each display shall provide large, 3-1/2 digit, LCD characters visible to 10 feet. The display resolution shall be 1 pound /0.1 kilograms and shall be selectable for indication in pounds or kilograms. The electronics shall be housed in a NEMA 4X enclosure.

E. The scale shall provide an isolated 4-20 mA output signal.

F. An independent low weight alarm for each platform shall be provided. Alarm shall be field adjustable between 0 and 20 pounds, for connection to remote annunciators.

G. Bumper pads to protect the electronics during cylinder change shall be provided. A safety chain shall support two cylinders while in operation. All exposed parts shall be either stainless steel or coated with polyurethane.

H. The scale shall operate from 120 Vac, 60 Hz 1 phase power supply. The scale shall be provided with a flexible power cord and 120 Vac 3-prong plug.

2.1.13 Chlorine Manifold, Accessories

2.1.13.1 Drip Leg Heater:

A. The drip leg heater shall be explosion proof and mount on the lowest portion of the drip leg. The heater should be activated when feeding chemical and can remain so when not feeding chemical.

B. The heater shall be U.L. recognized and C.S.A. certified. The condulet shall be U.L. listed and C.S.A. approved. The heater wattage shall be 25 watts.

C. The power supply shall be 120 Vac 50/60 Hz, 1 phase power supply.

2.2 PIPING

2.2.1 Water Piping

Water piping shall be galvanized steel conforming to ASTM A 53 or copper tubing conforming to ASTM B 88. Malleable-iron unions and fittings for installation of steel pipe shall conform to ASME B16.3.

2.2.2 Chlorine Piping

Chlorine solution piping smaller than 1-1/2 inches in diameter shall be PVC pipe conforming to ASTM D 1785 or CPVC pipe conforming to ASTM F 441/F 441M or rubber hose. Piping of 1-1/2 inches in diameter or larger shall be plastic pipe . Linings for steel pipe smaller than 6 inches shall be not less than 1/8 inch thick, and for steel pipe larger than 6 inches, it

shall be not less than 3/16 inch thick. Fittings for plastic pipe shall be of plastic with threaded joints. Joints for rubber hose shall be made using a clamp-type mechanical coupling. Steel pipe shall have threaded . Fittings for steel pipe shall be flanged conforming to ASME B16.1 or ASME B16.5 or forged-steel threaded conforming to ASME B16.11.

2.2.3 Cylinder Connections

Cylinder connections shall be flexible metal tubing of required size cadmium-plated copper. Flexible cylinder connector assembly shall be installed with lead-gasketed, naval-bronze fittings.

2.3 ELECTRICAL WORK

Electric motor-driven equipment, and wiring shall be in accordance with Section 16415 ELECTRICAL WORK, INTERIOR. Ratings shall be as indicated. Motor starters shall be provided complete with thermal-overload protection and other appurtenances necessary for motor controls specified. Manual or automatic control and protective or signal devices required for controls and devices shall be provided. All electrical connections at junction terminal boxes and at contactor-starter unit enclosures shall be prewired.

2.4 EQUIPMENT APPURTENANCES

Bolts, nuts, anchors, washers, and all other types of supports necessary for the installation of the equipment shall be galvanized steel, cadmium plated steel, or Type 316 stainless steel.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Chlorine-Feeding Equipment

The chlorine feeding machines, and all equipment appurtenances shall be installed in accordance with CI Pamphlet 1 and CI Pamphlet 6 so as to provide a complete and integrated system in accordance with the instructions of the manufacturer and under the direct supervision of the manufacturer's representative.

3.1.2 Pipe, Tubing, Hangers, and Supports

The installation of pipes and tubes shall be in accordance with Section 15400A PLUMBING, GENERAL PURPOSE.

3.1.3 Fiberglass Enclosure - Building 1318

The FRP enclosure shall be completely assembled (including all internal lighting and control wiring), compact type, ready to install, and capable of housing the specified equipment.

The FRP enclosure shall interior dimensions of 10 feet-6 inches long by 8 feet-6 inches wide by 6 feet-6 inches high. It shall be constructed of wood framing of suitable size to provide structrual integrity and to carry all required service loads. After framing, all voids shall be filled with a minimum of 1/2 inch urethane foam insulation and a skin of 5/32 inch masonite shall be applied to the outside of the enclosure. The enclosure

shall be covered with sprayed-on polyester resin and fiberglass of 30 percent glass fibers and then coated with white orthophalic gelcoat for maintenance-free protection.

A 12 inch by 12 inch wireless window shall be provided in the door for inspection of the interior without opening the door. The door (36 inches wide by 72 inches high) shall be hinged and key lockable.

The enclosure shall also include, as shown on the plans; but not limited to the following;

a. Light with protective cover.
b. Switch for light and supply fan located on the exterior of the enclosure.
c. Switch for booster pump control located on the interior of the enclosure.
d. Supply fan with thermostatic control. Supply fan shall automatically come on should temperarures exceed thermostatic setting.
e. A heater, 1500 watt thermostatically controlled.
f. Duplex receptacle.
g. Gravity operated louver.
h. Manual operated vent to outside.
i. Electrical junction box.

The enclosure shall be sealed and anchored to the required slab with stainless steel angles bolted to the slab and inside building walls.

[AM#3]The enclosure shall be manufactured by one of the following:

1. Chlor-Serv, Inc.
Hutto, Texas 1-800-890-3977

2. Control Process Systems, Inc.
P.O. Box 9666
Tulsa, Oklahoma 74157
Phone: 800-652-6789
Fax: 918-446-8812

3. Powerhouse Marine International, Inc.
2626 Wilson Road
Humble, Texas 77396
Mail: P.O.Box 368 77347-0368
Phone: 281-446-9777
Fax: 281-446-3347

3.2 TESTING

After installation of the chlorine-feeding machine is complete, operating tests shall be carried out to assure that the chlorine-feeding installation operates properly. All piping shall be tested hydrostatically and for leaks. If any deficiencies are revealed during any tests, such deficiencies shall be corrected and the tests shall be reconducted.

3.3 PAINTING

3.3.1 Factory Painting

Factory painting shall conform to manufacturer's standard factory finish.

3.3.2 Field Painting

Equipment which did not receive a factory finish shall be painted as specified in Section 09900 PAINTING, GENERAL. Factory painted items requiring touching up in the field, shall be thoroughly cleaned of all foreign material and shall be primed and topcoated with the manufacturer's standard factory finish provided it does not discolor in the presence of hydrogen sulfide fumes, high water vapor atmosphere, alkaline water vapor, and concentrated chlorine (oxidizing) conditions. Coating shall be not less than 1.78 mils thick.

3.4 FRAMED INSTRUCTIONS

Framed operating instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

3.5 MANUFACTURER'S FIELD SERVICE

3.5.1 Manufacturer's Supervision

Services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment.

3.5.2 Field Training

A field training course shall be provided for designated operating staff members. Training shall be provided for a total period of 8 hours of normal working time and shall start after the system is functionally complete but prior to final acceptance tests. Field training shall cover all of the items contained in the operating and maintenance instructions.

-- End of Section --

SECTION 13110

CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)
11/98
AMMENDMENT NO. 0002 & 0003

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.

ASTM INTERNATIONAL (ASTM)

ASTM B 418	(2001) Cast and Wrought Galvanic Zinc Anodes
ASTM B 843	(1993; R 1998) Magnesium Alloy Anodes for Cathodic Protection
ASTM D 1248	(2002) Polyethylene Plastics Extrusion Materials for Wire and Cable

NACE INTERNATIONAL (NACE)

NACE RP0169	(1996) Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE RP0177	(2000) Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems
NACE RP0188	(1999) Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
NACE RP0190	(1995) External Protective Coatings for Joints, Fittings, and Valves on Metallic Underground or Submerged Pipelines and Piping Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA TC 2	(1998) Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 and EPC-80)
NEMA WC 5	(1992; Rev 2 1996) Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2002) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 510	(1994; Rev thru Apr 1998) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 514A	(1996; Rev thru Nov 2001) Metallic Outlet Boxes
UL 6	(2000) Rigid Metal Conduit

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Drawings; G

Six copies of detail drawings consisting of a complete list of equipment and material including manufacturer's descriptive and technical literature, catalog cuts, results of system design calculations including soil-resistivity, installation instructions and certified test data stating the maximum recommended anode current output density and the rate of gaseous production if any at that current density. Detail drawings shall contain complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will function properly as a unit.

Contractor's Modifications; G

Six copies of detail drawings showing proposed changes in location, scope of performance indicating any variations from, additions to, or clarifications of contract drawings. The drawings shall show proposed changes in anode arrangement, anode size and number, anode materials and layout details, conduit size, wire size, mounting details, wiring diagram, method for electrically-isolating each pipe, and any other pertinent information to proper installation and performance of the system.

SD-03 Product Data

Equipment; G

Within 30 days after receipt of notice to proceed, an itemized list of equipment and materials including item number, quantity, and manufacturer of each item. The list shall be accompanied by a description of procedures for each type of testing and

adjustments, including testing of coating for thickness and holidays. Installation of materials and equipment shall not commence until this submittal is approved.

Spare Parts; G

Spare parts data for each different item of material and equipment specified, after approval of detail drawings and not later than six (6) months prior to the date of beneficial occupancy. The data shall include a complete list of parts, special tools, and supplies, with current unit prices and source of supply. One (1) spare anode of each type shall be furnished.

SD-06 Test Reports

Tests and Measurements; G

Test reports in booklet form tabulating all field tests and measurements performed, upon completion and testing of the installed system and including close interval potential survey, **[AM#3]** _____ interference tests, final system test verifying protection, insulated joint and bond tests, and holiday coating test. A certified test report showing that the connecting method has passed a 120-day laboratory test without failure at the place of connection, wherein the anode is subjected to maximum recommended current output while immersed in a three percent sodium chloride solution.

Contractor's Modifications; G

Final report regarding Contractor's modifications. The report shall include pipe-to-soil measurements throughout the affected area, indicating that the modifications improved the overall conditions, and current measurements for anodes. The following special materials and information are required: taping materials and conductors; zinc grounding cell, installation and testing procedures, and equipment; coating material; system design calculations for anode number, life, and parameters to achieve protective potential; backfill shield material and installation details showing waterproofing; bonding and waterproofing details; insulated resistance wire; exothermic weld equipment and material.

SD-07 Certificates

Cathodic Protection System; G

Proof that the materials and equipment furnished under this section conform to the specified requirements contained in the referenced standards or publications. The label or listing by the specified agency will be acceptable evidence of such compliance.

Services of "Corrosion Expert"; G

Evidence of qualifications of the "corrosion expert."

a. The "corrosion expert's" name and qualifications shall be certified in writing to the Contracting Officer prior to the

start of construction.

b. Certification shall be submitted giving the name of the firm, the number of years of experience, and a list of not less than five (5) of the firm's installations three (3) or more years old that have been tested and found satisfactory.

SD-10 Operation and Maintenance Data

Cathodic Protection System; G

Before final acceptance of the cathodic protection system, six copies of operating manuals outlining the step-by-step procedures required for system startup, operation, adjustment of current flow, and shutdown. The manuals shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six copies of maintenance manual, listing routine maintenance procedures, recommendation for maintenance testing, possible breakdowns and repairs, and troubleshooting guides. The manuals shall include single-line diagrams for the system as installed; instructions in making pipe-to-reference cell and tank-to-reference cell potential measurements and frequency of monitoring; instructions for dielectric connections, interference and sacrificial anode bonds; instructions shall include precautions to ensure safe conditions during repair of pipe or other metallic systems. The instructions shall be neatly bound between permanent covers and titled "Operating and Maintenance Instructions." These instructions shall be submitted for the Contracting Officer's approval. The instructions shall include the following:

a. As-built drawings, to scale of the entire system, showing the locations of the piping, location of all anodes and test stations, locations of all insulating joints, and structure-to-reference cell potentials as measured during the tests required by Paragraph: TESTS AND MEASUREMENTS, of this section.

b. Recommendations for maintenance testing, including instructions in making pipe-to-reference cell potential measurements and frequency of testing.

c. All maintenance and operating instructions and nameplate data shall be in English.

d. Instructions shall include precautions to insure safe conditions during repair of pipe system.

Training Course; G

The proposed Training Course Curriculum (including topics and dates of discussion) indicating that all of the items contained in the operating and maintenance instructions, as well as demonstrations of routine maintenance operations, including testing procedures included in the maintenance instructions, are to be covered.

1.3 GENERAL REQUIREMENTS

The Contractor shall furnish and install a complete, operating, sacrificial anode cathodic protection system in complete compliance with NFPA 70, with all applicable Federal, State, and local regulations and with minimum requirements of this contract. The services required include planning, installation, adjusting and testing of a cathodic protection system, using sacrificial anodes for cathodic protection of the encasement pipes. The cathodic protection system shall include anodes, cables, connectors, corrosion protection test stations, and any other equipment required for a complete operating system providing the NACE criteria of protection as specified. Insulators are required whenever needed to insulate the pipes from any other structure. Any pipe crossing the encasement pipe shall have a test station. The cathodic protection shall be provided on encasement pipes.

1.3.1 Services of "Corrosion Expert"

The Contractor shall obtain the services of a "corrosion expert" to supervise, inspect, and test the installation and performance of the cathodic protection system. "Corrosion expert" refers to a person, who by thorough knowledge of the physical sciences and the principles of engineering and mathematics, acquired by professional education and related practical experience, is qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces. Such a person must be accredited or certified by the National Association of Corrosion Engineers (NACE) as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection (CP) Specialist or be a registered professional engineer who has certification or licensing that includes education and experience in corrosion control of buried or submerged metallic piping and tank systems, if such certification or licensing includes 5 years experience in corrosion control on underground metallic surfaces of the type under this contract. The "corrosion expert" shall make at least 3 visits to the project site. The first of these visits shall include obtaining soil resistivity data, acknowledging the type of pipeline coatings to be used and reporting to the Contractor the type of cathodic protection required. Once the submittals are approved and the materials delivered, the "corrosion expert" shall revisit the site the ensure the Contractor understands installation practices and laying out the components. The third visit shall involve testing the installed cathodic protection systems and training applicable personnel on proper maintenance techniques. The "corrosion expert" shall supervise installation and testing of all cathodic protection.

1.3.2 Contractor's Modifications

The specified system is based on a complete system with magnesium sacrificial anodes. The Contractor may modify the cathodic protection system after review of the project, site verification, and analysis, if the proposed modifications include the anodes specified and will provide better overall system performance. The modifications shall be fully described, shall be approved by the Contracting Officer's representative, and shall meet the following criteria. The proposed system shall achieve a minimum pipe-to-soil "instant off" potential of minus 850 millivolts with reference to a saturated copper-copper sulfate reference cell on the underground components of the piping or other metallic surface. The Contractor shall

take resistivity measurements of the soil in the vicinity of the pipes and ground bed sites. Based upon the measurements taken, the current and voltage shall be required to produce a minimum of minus 850 millivolts "instant off" potential between the structure being tested and the reference cell. This potential shall be obtained over 95 percent of the metallic area. The anode system shall be designed for a life of twenty-five (25) years of continuous operation.

1.3.3 Isolators

Isolators are required to insulate the indicated pipes from any other structure. Isolators shall be provided with lightning protection and a test station as shown.

1.3.4 Anode and Bond Wires

Provide magnesium anodes in the quantity and sizes necessary to achieve full protection over a 30-year life span. A minimum of 2 test stations per encasement shall be used for these anodes. For each cathodic system, the metallic components and structures to be protected shall be made electrically continuous. This shall be accomplished by installing bond wires between the various structures. Bonding of existing buried structures may also be required to preclude detrimental stray current effects and safety hazards. Provisions shall be included to return stray current to its source without damaging structures intercepting the stray current. The electrical isolation of underground facilities in accordance with acceptable industry practice shall be included under this section. All tests shall be witnessed by the Contracting Officer.

1.3.5 Surge Protection

Approved zinc grounding cells or sealed weatherproof lightning arrestor devices shall be installed across insulated flanges or fittings installed in underground piping as indicated on the drawings. The arrestor shall be gapless, self-healing, solid state type. Zinc anode composition shall conform to ASTM B 418, Type II. Lead wires shall be number 6 AWG copper with high molecular weight polyethylene (HMWPE) insulation. The zinc grounding cells shall not be prepackaged in backfill but shall be installed as detailed on the drawings. Lightning arrestors or zinc grounding cells are not required for insulated flanges on metallic components used on nonmetallic piping systems.

1.3.6 Summary of Services Required

The scope of services shall include, but shall not be limited to, the following:

a. Close-interval potential surveys.

b. Cathodic Protection Systems.

c. System testing.

[AM#3] d. (_____.).

e. Interference testing.

f. Training.

g. Operating and maintenance manual.

h. Insulator testing and bonding testing.

i. Coating and holiday testing shall be submitted within 45 days of notice to proceed.

1.3.7 Nonmetallic Pipe System

In the event pipe other than metallic pipe is approved and used in lieu of metallic pipe, all metallic components of this pipe system shall be protected with cathodic protection. Detailed drawings of cathodic protection for each component shall be submitted to the Contracting Officer for approval within 45 days after date of receipt of notice to proceed, and before commencement of any work.

1.3.7.1 Coatings

Coatings for metallic components shall be as required for metallic fittings. Protective covering (coating and taping) shall be completed and tested on each metallic component (such as valves, hydrants and fillings). This covering shall be as required for underground metallic pipe. Each test shall be witnessed by the Contracting Officer. Coatings shall be selected, applied, and inspected in accordance with NACE RP0190 and as specified in these specifications. The use of nonmetallic pipe does not change other requirements of the specifications. Any deviations due to the use of nonmetallic pipe shall be submitted for approval.

1.3.7.2 Tracer Wire

When a nonmetallic pipe line is used to extend or add to an existing metallic line, an insulated No. 8 AWG copper wire shall be thermit-welded to the existing metallic line and run the length of the new nonmetallic line. This wire shall be used as a locator tracer wire and to maintain continuity to any future extensions of the pipe line.

1.3.8 Tests of Components

A minimum of four (4) tests shall be made at each metallic component in the piping system. Two (2) measurements shall be made directly over the anodes and the other two (2) tests shall be over the outer edge of the component, but at the farthest point from the anodes. Structure and pipes shall be shown with the cathodic protection equipment. All components of the cathodic protection system shall be shown on drawings, showing their relationship to the protected structure or component. A narrative shall describe how the cathodic protection system will work and provide testing at each component. Components requiring cathodic protection shall include but not be limited to the following:

a. **[AM#3]** (_____.).

b. **[AM#2]** (_____.)

c. **[AM#2]** (_____.)

d. **[AM#2]** (_____.)

e. **[AM#2]** (_____.)

f. **[AM#2]** (_____.)

g. **[AM#2]** (_____.)

h. **[AM#2]** (_____.)

1.3.9 Drawings

Detailed drawings shall be provided showing location of anodes, insulated fittings, test stations, permanent reference cells, and bonding. Locations shall be referenced to two (2) permanent facilities or mark points.

1.3.10 Electrical Potential Measurements

All potential tests shall be made at a minimum of 10 foot intervals witnessed by the Contracting Officer. Submittals shall identify test locations on separate drawing, showing all metal to be protected and all cathodic protection equipment. Test points equipment and protected metal shall be easily distinguished and identified.

1.3.11 Achievement of Criteria for Protection

All conductors, unless otherwise shown, shall be routed to or through the test stations. Each system provided shall achieve a minimum pipe-to-soil "instant off" potential of minus 850 millivolt potentials with reference to a saturated copper-copper-sulfate reference cell on all underground components of the piping. Based upon the measurements taken, the current and voltage of the anodes should be adjusted as required to produce a minimum of minus 850 millivolts "instant off" potential between the structure being tested and the reference cell. This potential should be obtained over 95 percent of the metallic area. This must be achieved without the "instant off" potential exceeding 1150 millivolts. Testing will be witnessed by the Contracting Officer. Additional anodes shall be provided by the Contractor if required to achieve the minus 850 millivolts "instant off". Although acceptance criteria of the cathodic protection systems are defined in NACE RP0169, for this project the "instant off" potential of minus 850 millivolts is the only acceptable criteria.

1.3.12 Metallic Components and Typicals

a. Metallic components: As a minimum, each metallic component shall be protected with two (2) magnesium anodes. This number of anodes is required to achieve minus 850 millivolts "instant off" potential on the metallic area and at the same time not provide overvoltage above 1150 millivolts "instant off." As a minimum, the magnesium anode unpackaged weight shall be 9 pounds. The magnesium anodes shall be located on each side of the metallic component and routed through a test station.

a. Metallic Pipe Component or Section: Each section of metallic pipe shall be protected with at least 2 magnesium anodes. The magnesium anodes shall have an unpackaged weight of at least 9 pounds.

b. Connectors or Change-of-Direction Devices: Each

change-of-direction device shall be protected with 2 magnesium anodes. The magnesium anode shall have an unpackaged weight of 9 pounds.

1.3.13 Metallic Component Coating

Coatings for metallic components shall be as required for metallic fittings as indicated. This will include fire hydrants, T's, elbows, valves, etc. Coatings shall be selected, applied, and inspected in accordance with NACE RP0190 and as specified in these specifications.

PART 2 PRODUCTS

2.1 MAGNESIUM ANODES

A minimum of 2 anodes shall be installed on the encasement.

2.1.1 Anode Composition

Anodes shall be of high-potential magnesium alloy, made of primary magnesium obtained from sea water or brine, and not made from scrap metal. Magnesium anodes shall conform to ASTM B 843 and to the following analysis (in percents) otherwise indicated:

Aluminum, max.	0.010
Manganese, max.	0.50 to 1.30
Zinc	0.05
Silicon, max.	0.05
Copper, max.	0.02
Nickel, max.	0.001
Iron, Max.	0.03
Other impurities, max.	0.05 each or 0.3 max. total
Magnesium	Remainder

The Contractor shall furnish spectrographic analysis on samples from each heat or batch of anodes used on this project.

2.1.2 Dimensions and Weights

Dimensions and weights of anodes shall be approximately as follows:

TYPICAL MAGNESIUM ANODE SIZE

(Cross sections may be round, square, or D shaped)

NOMINAL WT. LBS.	APPROX. SIZE (IN)	NOMINAL GROSS WT lb PACKAGED IN BACKFILL	NOMINAL PACKAGE DIMENSIONS (IN)
3	3 X 3 X 5	8	5-1/4 X 5-1/4 X 8
5	3 X 3 X 8	13	5-1/4 X 5-1/4 X 11-1/4
9	3 X 3 X 14	27	5-1/4 X 20
12	4 X 4 X 12	32	7-1/2 X 18
17	4 X 4 X 17	45	7-1/2 X 24
32	5 X 5 X 20-1/2	68	8-1/2 X 28
50	7 X 7 X 16	100	10 X 24

2.1.3 Packaged Anodes

Anodes shall be provided in packaged form with the anode surrounded by specially-prepared quick-wetting backfill and contained in a water permeable cloth or paper sack. Anodes shall be centered by means of spacers in the backfill material. The backfill material shall have the following composition, unless otherwise indicated:

Material	Approximate Percent by Weight
Gypsum	75
Bentonite	20
Sodium Sulphate	5
Total	100

2.1.4 Zinc Anodes

Zinc anodes shall conform to ASTM B 418, Type II.

2.1.5 Connecting Wire

2.1.5.1 Wire Requirements

Wire shall be No. 10 AWG solid copper wire, not less than 10 feet long, unspliced, complying with NFPA 70, Type RHH insulation. Connecting wires for magnesium anodes shall be factory installed with the place or emergence from the anode in a cavity sealed flush with a dielectric sealing compound. Connecting wires for zinc anodes shall be factory installed with the place of connection to the protruding steel core completely sealed with a dielectric material.

2.1.5.2 Anode Header Cable

Cable for anode header and distribution shall be No. 6 AWG stranded copper wire with type CP high molecular weight polyethylene, 7/64 inch thick insulation, 600-volt rating, in accordance with NEMA WC 5.

2.2 MISCELLANEOUS MATERIALS

2.2.1 Electrical Wire

Wire shall be No. 10 AWG stranded copper wire with NFPA 70, Type RHW-USE insulation. Polyethylene insulation shall comply with the requirements of ASTM D 1248 and shall be of the following types, classes, and grades:

High-molecular weight polyethylene shall be Type I, Class C, Grade E5.

High-density polyethylene shall be Type III, Class C, Grade E3.

2.2.1.1 Wire Splicing

Connecting wire splicing shall be made with copper compression connectors or exothermic welds, following instructions of the manufacturer. Single split-bolt connections shall not be used. Sheaths for encapsulating electrical wire splices to be buried underground shall fit the insulated wires entering the spliced joints and epoxy potting compound shall be as

specified below.

2.2.1.2 Test Wires

Test wires shall be AWG No. 12 stranded copper wire with NFPA 70, Type TW or RHW or polyethylene insulation.

2.2.1.3 Resistance Wire

Resistance wire shall be AWG No. 16 or No. 22 nickel-chromium wire.

2.2.2 Conduit

Rigid galvanized steel conduit and accessories shall conform to UL 6. Non metallic conduit shall conform to NEMA TC 2.

2.2.3 Test Boxes and Junctions Boxes

Boxes shall be outdoor type conforming to UL 514A.

2.2.4 Joint, Patch, Seal, and Repair Coating

Sealing and dielectric compound shall be a black, rubber based compound that is soft, permanently pliable, tacky, moldable, and unbacked. Compound shall be applied as recommended by the manufacturer, but not less than 1/2-inch thick. Coating compound shall be hot-applied coal-tar enamel. Pressure-sensitive vinyl plastic electrical tape shall conform to UL 510.

2.2.5 Backfill Shields

Shields shall consist of approved pipeline wrapping or fiberglass-reinforced, coal-tar impregnated tape, or plastic weld caps, specifically made for the purpose and installed in accordance with the manufacturer's recommendations. When joint bonds are required, due to the use of mechanical joints, the entire joint shall be protected by the use of a kraft paper joint cover. The joint cover shall be filled with poured-in, hot coat-tar enamel.

2.2.6 Epoxy Potting Compound

Compound for encapsulating electrical wire splices to be buried underground shall be a two package system made for the purpose.

2.2.7 Test Stations

Stations shall be of the flush-curb-box type and shall be the standard product of a recognized manufacturer. Test stations shall be complete with an insulated terminal block having the required number of terminals. The test station shall be provided with a lockable over and shall have an embossed legend, "C.P. Test." A minimum of one (1) test station shall be provided each component of the encasement. A minimum of six (6) terminals shall be provided in each test station. A minimum of two (2) leads are required to the metallic pipe from each test station. Other conductors shall be provided for each anode, other foreign pipe, and reference cells as required.

2.2.8 Joint and Continuity Bonds

Bonds shall be provided across all joints in the metallic encasement lines, across any electrically discontinuous connections and all other pipes and structures with other than welded or threaded joints that are included in this cathodic protection system. Unless otherwise specified in the specifications, bonds between structures and across joints in pipe with other than welded or threaded joints shall be No. 8 AWG stranded copper cable with polyethylene insulation. Bonds between structures shall contain sufficient slack for any anticipated movement between structures. Bonds across pipe joints shall contain a minimum of 4 inches of slack to allow for pipe movement and soil stress. Bonds shall be attached by exothermic welding. Exothermic weld areas shall be insulated with coating compound and approved, and witnessed by the Contracting Officer. Continuity bonds shall be installed as necessary to reduce stray current interference. Additional joint bondings shall be accomplished by the Contractor where the necessity is discovered during construction or testing or where the Contracting Officer's representative directs that such bonding be done. Joint bonding shall include all associated excavation and backfilling. There shall be a minimum of two (2) continuity bonds between each structure and other than welded or threaded joints. The Contractor shall test for electrical continuity across all joints with other than welded or threaded joints and across all metallic portions or components. The Contractor shall provide bonding as required and as specified above until electrical continuity is achieved. Bonding test data shall be submitted for approval.

2.2.9 Resistance Bonds

Resistance bonds should be adjusted as outlined in this specification. Alternate methods may be used if they are approved by the Contracting Officer.

2.2.10 Stray Current Measurements

Stray current measurements should be performed at each test station. Stray currents resulting from lightning or overhead alternating current (AC) power transmission systems shall be mitigated in accordance with NACE RP0177.

2.2.11 Resistance Wire

Wire shall be No. 16 or No. 22 nickel-chromium wire with TW insulation.

2.2.12 Electrical Connections

Electrical connections shall be done as follows:

a. Exothermic welds shall be "Cadweld"," Bundy", "Thermoweld" or an approved equal. Use of this material shall be in strict accordance with the manufacturer's recommendations.

b. Electrical-shielded arc welds shall be approved for use on steel pipe by shop drawing submittal action.

c. Brazing shall be as specified in Paragraph: Lead Wire Connections.

2.2.13 Electrical Tape

Pressure-sensitive vinyl plastic electrical tape shall conform to UL 510.

2.2.14 Permanent Reference Electrodes

Permanent reference electrodes shall be Cu-CuS04 electrodes suitable for direct burial. Electrodes shall be guaranteed by the supplier for 15 years' service in the environment in which they shall be placed. Electrodes shall be installed directly beneath pipe, or metallic component.

2.2.15 **[AM#3] DELETED**

PART 3 EXECUTION

3.1 CRITERIA OF PROTECTION

Acceptance criteria for determining the adequacy of protection on a buried underground metallic component shall be in accordance with NACE RP0169 and as specified below.

3.1.1 Iron and Steel

The following method (a) shall be used for testing cathodic protection voltages. If more than one method is required, method (b) shall be used.

a. A negative voltage of at least minus 850 millivolts as measured between the underground component and a saturated copper-copper sulphate reference electrode connecting the earth (electrolyte) directly over the underground component. Determination of this voltage shall be made with the cathodic protection system in operation. Voltage drops shall be considered for valid interpretation of this voltage measurement. A minimum of minus 850 millivolts "instant off" potential between the underground component being tested and the reference cell shall be achieved over 95 percent of the area of the structure. Adequate number of measurements shall be obtained over the entire structure, pipe, tank, or other metallic component to verify and record achievement of minus 850 millivolts "instant off." This potential shall be obtained over 95 percent of the total metallic area without the "instant off" potential exceeding 1200 millivolts.

b. A minimum polarization voltage shift of 100 millivolts as measured between the underground component and a saturated copper-copper sulphate reference electrode contacting the earth directly over the underground component. This polarization voltage shift shall be determined by interrupting the protective current and measuring the polarization decay. When the protective current is interrupted, an immediate voltage shift will occur. The voltage reading, after the immediate shift, shall be used as the base reading from which to measure polarization decay. Measurements achieving 100 millivolts decay shall be made over 95 percent of the metallic surface being protected.

c. For any metallic component, a minimum of four (4) measurements shall be made using subparagraph (a), above, and achieving the "instant off" potential of minus 850 millivolts. Two (2) measurements shall be made over the anodes and two (2) measurements shall be made at different locations near the component and farthest away from the anode.

3.1.2 **[AM#2] DELETED**

3.1.3 **[AM#2] DELETED**

3.2 ANODE STORAGE AND INSTALLATION

3.2.1 Anode Storage

Storage area for magnesium anodes will be designated by the Contracting Officer. If anodes are not stored in a building, tarps or similar protection should be used to protect anodes from inclement weather. Packaged anodes, damaged as a result of improper handling or being exposed to rain, shall be resacked by the Contractor and the required backfill added.

3.2.2 Anode Installation

Unless otherwise authorized, installation shall not proceed without the presence of the Contracting Officer. Anodes of the size specified shall be installed to the depth indicated and at the locations shown. Locations may be changed to clear obstructions with the approval of the Contracting Officer. Anodes shall be installed in sufficient number and of the required type, size, and spacing to obtain a uniform current distribution over the surface of the structure. The anode system shall e designed for a life of 25 years of continuous operation. Anodes shall be installed as indicated in a dry condition after any plastic or waterproof protective covering has been completely removed from the water permeable, permanent container housing the anode metal. The anode connecting wire shall not be used for lowering the anode into the hole. The annular space around the anode shall be backfilled with fine earth in 6 inch layers and each layer shall be hand tamped. Care must be exercised not to strike the anode or connecting wire with the tamper. Approximately 5 gallonsof water shall be applied to each filled hole after anode backfilling and tamping has been completed to a point about 6inches above the anode. After the water has been absorbed by the earth, backfilling shall be completed to the ground surface level.

3.2.2.1 Single Anodes

Single anodes shall be connected through a test station to the pipeline, allowing adequate slack in the connecting wire to compensate for movement during backfill operation.

3.2.2.2 Groups of Anodes

Groups of anodes, in quantity and location shown, shall be connected to an anode header cable. The anode header cable shall make contact with the structure to be protected only through a test station. Anode lead connection to the anode header cable shall be made by an approved crimp connector or exothermic weld and splice mold kit with appropriate potting compound.

3.2.2.3 Welding Methods

Connections to ferrous pipe shall be made by exothermic weld methods manufactured for the type of pipe supplied. Electric arc welded connections and other types of welded connections to ferrous pipe and

structures shall be approved before use.

3.2.3 Anode Placement - General

Packaged anodes shall be installed completely dry, and shall be lowered into holes by rope sling or by grasping the cloth gather. The anode lead wire shall not be used in lowering the anodes. The hole shall be backfilled with fine soil in 6inch layers and each layer shall be hand-tamped around the anode. Care must be exercised not to strike the anode or lead wire with the tamper. If immediate testing is to be performed, water shall be added only after backfilling and tamping has been completed to a point 6 inches above the anode. Approximately 2 gallons of water may be poured into the hole. After the water has been absorbed by the soil, backfilling and tamping may be completed to the top of the hole. Anodes shall be installed as specified or shown. In the event a rock strata is encountered prior to achieving specified augered-hole depth, anodes may be installed horizontally to a depth at least as deep as the bottom of the pipe, with the approval of the Contracting Officer.

3.2.4 Underground Pipeline

Anodes shall be installed at a minimum of 8 feet and a maximum of 10 feet from the line to be protected.

3.2.5 Installation Details

Details shall conform to the requirements of this specification. Details shown on the drawings are indicative of the general type of material required, and are not intended to restrict selection to material of any particular manufacturer.

3.2.6 Lead Wire Connections

3.2.6.1 Underground Pipeline (Metallic)

To facilitate periodic electrical measurements during the life of the sacrificial anode system and to reduce the output current of the anodes, if required, all anode lead wires shall be connected to a test station and buried a minimum of 24 inches in depth. The cable shall be No. 10 AWG, stranded copper, polyethylene or RHW-USE insulated cable. The cable shall make contact with the structure only through a test station. Resistance wire shall be installed between the cable and the pipe cable, in the test station, to reduce the current output, if required. Anode connections, except in the test station, shall be made with exothermic welding process, and shall be insulated by means of at least three (3) layers of electrical tape; and all lead wire connections shall be installed in a moistureproof splice mold kit and filled with epoxy resin. Lead wire-to-structure connections shall be accomplished by an exothermic welding process. All welds shall be in accordance with the manufacturer's recommendations. A backfill shield filled with a pipeline mastic sealant or material compatible with the coating shall be placed over the weld connection and shall be of such diameter as to cover the exposed metal adequately.

3.2.6.2 Resistance Wire Splices

Resistance wire connections shall be accomplished with silver solder and

the solder joints wrapped with a minimum of three (3) layers of pressure-sensitive tape. Lead wire connections shall be installed in a moistureproof splice mold kit and filled with epoxy resin.

3.2.7 Location of Test Stations

Test stations shall be curb box mounted. Buried insulating joints shall be provided with test wire connections brought to a test station. Unless otherwise shown, other test stations shall be located as follows:

a. At 1,000-foot intervals or less.

b. Where the pipe or conduit crosses any other metal pipe.

c. **[AM#3] DELETED**.

d. Where both sides of an insulating joint are not accessible above ground for testing purposes.

3.2.8 Underground Pipe Joint Bonds

Underground pipe having other than welded or threaded coupling joints shall be made electrically continuous by means of a bonding connection installed across the joint.

3.3 ELECTRICAL ISOLATION OF STRUCTURES

3.3.1 Isolation Joints and Fittings

Isolating fittings, including main line isolating flanges and couplings, shall be installed aboveground, or within manholes, wherever possible. Where isolating joints must be covered with soil, they shall be fitted with a paper joint cover specifically manufactured for covering the particular joint, and the space within the cover filled with hot coal-tar enamel. Isolating fittings in lines entering buildings shall be located at least 12 inches above grade of floor level, when possible. Isolating joints shall be provided with grounding cells to protect against over-voltage surges or approved surge protection devices. The cells shall provide a low resistance across isolating joint without excessive loss of cathodic current.

3.3.2 **[AM#2] DELETED**

3.4 TRENCHING AND BACKFILLING

Trenching and backfilling shall be in accordance with Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITY SYSTEMS.

3.5 TESTS AND MEASUREMENTS

3.5.1 Baseline Potentials

Each test and measurement will be witnessed by the Contracting Officer. The Contractor shall notify the Contracting Officer a minimum of five (5) working days prior to each test. After backfill of the pipe, the static potential-to-soil of the pipe shall be measured. The locations of these measurements shall be identical to the locations specified for pipe-

to-reference electrode potential measurements. The initial measurements shall be recorded.

3.5.2 Isolation Testing

Before the anode system is connected to the pipe, an isolation test shall be made at each isolating joint or fitting. This test shall demonstrate that no metallic contact, or short circuit exists between the two isolated sections of the pipe. Any isolating fittings installed and found to be defective shall be reported to the Contracting Officer.

3.5.2.1 Insulation Checker

A Model 601 insulation checker, as manufactured by "Gas Electronics", or an approved equal, using the continuity check circuit, shall be used for isolating joint (flange) electrical testing. Testing shall conform to the manufacturer's operating instructions. Test shall be witnessed by the Contracting Officer. An isolating joint that is good will read full scale on the meter. If an isolating joint is shorted, the meter pointer will be deflected or near zero on the meter scale. Location of the fault shall be determined from the instructions, and the joint shall be repaired. If an isolating joint is located inside a vault, the pipe shall be sleeved with insulator when entering and leaving the vault.

3.5.2.2 Cathodic Protection Meter

A Model B3A2 cathodic protection meter, as manufactured by "M.C. Miller", or an approved equal, using the continuity check circuit, shall be used for isolating joint (flange) electrical testing. This test shall be performed in addition to the Model 601 insulation checker. Continuity is checked across the isolation joint after the test lead wire is shorted together and the meter adjusted to scale. A full-scale deflection indicates the system is shorted at some location. The Model 601 verifies that the particular insulation under test is good and the Model B3A2 verifies that the system is isolated. If the system is shorted, further testing shall be performed to isolate the location of the short.

3.5.3 Anode Output

As the anodes or groups of anodes are connected to the pipe, current output shall be measured with an approved clamp-on milliammeter, calibrated shunt with a suitable millivoltmeter or multimeter, or a low resistance ammeter. (Of the three methods, the low-resistance ammeter is the least desirable and most inaccurate. The clamp-on milliammeter is the most accurate.) The valves obtained and the date, time, and location shall be recorded.

3.5.4 Reference Electrode Potential Measurements

Upon completion of the installation and with the entire cathodic protection system in operation, electrode potential measurements shall be made using a copper-copper sulphate reference electrode and a potentiometer-voltmeter, or a direct-current voltmeter having an internal resistance (sensitivity) of not less than 10 megohms per volt and a full scale of 10 volts. The locations of these measurements shall be identical to the locations used for baseline potentials. The values obtained and the date, time, and locations of measurements shall be recorded. No less than eight (8) measurements shall be made over any length of line or component.

Additional measurements shall be made at each distribution service riser, with the reference electrode placed directly over the service line.

3.5.5 Location of Measurements

3.5.5.1 Piping or Conduit

For coated piping or conduit, measurements shall be taken from the reference electrode located in contact with the earth, directly over the pipe. Connection to the pipe shall be made at service risers, valves, test leads, or by other means suitable for test purposes. Pipe-to-soil potential measurements shall be made at intervals not exceeding 5 feet. The Contractor may use a continuous pipe-to-soil potential profile in lieu of 5 foot interval pipe-to-soil potential measurements. Additional measurements shall be made at each distribution service riser, with the reference electrode placed directly over the service line adjacent to the riser. Potentials shall be plotted versus distance to an approved scale. Locations where potentials do not meet or exceed the criteria shall be identified and reported to the Contracting Officer's representative.

3.5.5.2 **[AM#2] DELETED**

3.5.5.3 **[AM#3] DELETED**

3.5.5.4 Interference Testing

Before final acceptance of the installation, interference tests shall be made with respect to any foreign pipes in cooperation with the owner of the foreign pipes. A full report of the tests giving all details shall be made. Stray current measurements shall be performed at all isolating locations and at locations where the new pipeline crosses foreign metallic pipes. The method of measurements and locations of measurements shall be submitted for approval. As a minimum, stray current measurements shall be performed at the following locations:

a. Connection point of new pipeline to existing pipeline.

b. Crossing points of new pipeline with existing lines.

Results of stray current measurements shall also be submitted for approval.

3.5.5.5 Holiday Test

Any damage to the protective covering during transit and handling shall be repaired before installation. After field-coating and wrapping has been applied, the entire pipe shall be inspected by an electric holiday detector with impressed current in accordance with NACE RP0188 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. Holidays in the protective covering shall be repaired upon detection. Occasional checks of holiday detector potential will be made by the Contracting Officer to determine suitability of the detector. Labor, materials, and equipment necessary for conducting the inspection shall be furnished by the Contractor. The coating system shall be inspected for holes, voids, cracks, and other damage during installation.

3.5.5.6 Recording Measurements

All pipe-to-soil potential measurements, including initial potentials where required, shall be recorded. The Contractor shall locate, correct and report to the Contracting Officer any short circuits to foreign pipes encountered during checkout of the installed cathodic protection system. Pipe-to-soil potential measurements shall be taken on as many pipes as necessary to determine the extent of protection or to locate short-circuits.

3.6 TRAINING COURSE

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 field instructions shall cover all of the items contained in the operating and maintenance instructions, as well as demonstrations of routine maintenance operations, including testing procedures included in the maintenance instructions. At least 14 days prior to date of proposed conduction of the training course, the training course curriculum shall be submitted for approval, along with the proposed training date. Training shall consist of demonstration of test equipment, providing forms for test data and the tolerances which indicate that the system works.

3.7 CLEANUP

The Contractor shall be responsible for cleanup of the construction site. All paper bags, wire clippings, etc., shall be disposed of as directed. Paper bags, wire clippings and other waste shall not be put in bell holes or anodes excavation.

3.8 MISCELLANEOUS INSTALLATION AND TESTING

3.8.1 Coatings

All aboveground pipeline shall be coated as indicated or as approved. The coating shall have a minimum thickness of 7 mil. The pipeline coating shall be in accordance with all applicable Federal, State, and local regulations.

3.8.2 Excavation

In the event rock is encountered in providing the required depth for anodes, the Contractor shall determine an alternate approved location and, if the depth is still not provided, an alternate plan shall be submitted to the Contracting Officer. Alternate techniques and depths must be approved prior to implementation.

3.9 SPARE PARTS

After approval of shop drawings, and not later than three (3) months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts, special tools, and supplies, with current unit prices and source of supply. In addition, the Contractor shall supply information for material and equipment replacement for all other components of the complete system, including anodes, cables, splice kits and connectors, corrosion test stations, and any other

components not listed above.

3.10 **[AM#2] DELETED**

3.11 SYSTEM TESTING

The Contractor shall submit a report including potential measurements taken at adequately-close intervals to establish that minus 850 millivolts potential, "instant-off" potential, is provided, and that the cathodic protection is not providing interference to other foreign pipes causing damage to paint or pipes. The report shall provide a narrative describing how the criteria of protection is achieved without damaging other pipe or structures in the area.

3.12 **[AM#2] DELETED**

-- End of Section --

SECTION 13112

SPECIALTY PRODUCTS

AMENDMENT NO. 0003

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Products; G, RE

A complete list of equipment and material, including manufacturer's descriptive data and technical literature, performance charts and curves, catalog cuts, and installation instructions. Spare parts data for each different item of material and equipment specified, after approval of the detail drawings and not later than 6 months prior to the date of beneficial occupancy. Data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 1 and 3 years of service.

PART 2 PRODUCTS

2.1 PUMP CONTROL VALVES

Pump control valves shall be provided on the water booster pumps as shown on the plans. The proposed 8 inch, 10 inch and 12 inch Pump Control Valves shall be as follows: The main valve shall be globe style, cast iron body, bronze trim with 125 lb. ANSI flanges, flat faced with full gaskets. The pilot control system shall be cast bronze with 303 stainless trim.

Valve shall be a diaphragm actuated single seated, hydraulically operated globe type valve. It shall have two operating chambers sealed from each other by a flexible synthetic rubber fully supported diaphragm. The valve disk shall be resilient with a rectangular cross section and shall be retained on 3-1/2 sides.

The main valve seat, the power unit body and the stem bearing in the valve cover shall be removable. The valve seat shall be retained by flat head machine screws for ease of maintenance.

Control of valve operation shall be by means of externally mounted pilot control system with a four-way solenoid operated pilot. Self cleaning strainers shall be used to protect the control system. Valve shall utilize

line pressure for operation. A limit switch shall be installed can easily be adjusted to operate at any point of the valve's travel. Valve shall be equipped with built-in lift type feature to prevent reverse flow and this feature shall operate independently of the solenoid feature. Pump control valve on pumps #1 and #3 at Tobin Wells shall have a 3-way valve to allow valve to operate when engines are running and electrical power is off.

Valve shall have opening and closing speed controls adjusted separately for rate of regulation. Initial setting shall be fast opening and slow closing. The valve will be fitted with a duel supply system to provide the highest pressure in the system for pilot control operation. Solenoid shall have capability for manual operation. No external packing glands or stuffing boxes will be permitted in the main valve.

The operation of this valve shall be as follows: Valve is designed to eliminate pipeline surges caused by starting and stopping of pump. Pumps start against a closed valve. When it is started the solenoid valve is energized and the valve begins to open slowly, gradually increasing line pressure to full pumping head.

When the pump is signaled to shut-off, the solenoid control valve is de-energized and the valve begins to close slowly, gradually reducing flow, while the pump continues to run. When the valve is closed a limit switch assembly serves as an electrical interlock between the valve and the pump, releasing the pump starter and the pump stops.

2.2 WATER DESANDER

There shall be furnished 2 water desanders for installation in water line to remove sand from water. Each desander shall consist of a cylindrical steel shell 20 inches in diameter with replaceable internal conical section and vortex finder, integral sand accumulator section, all mounted on self-supporting legs ready for installation of foundation bolts.

Each unit shall have 1,000 GPM capacity at a 7 psi pressure drop.

The desander shall be capable of removing 99 percent of the plus 150 mesh sand and 90 percent of the 200 mesh sand entering the feed inlet. The equipment shall be the product of a regular equipment manufacturer who has made equipment of comparable design and capacity for a period of at least 10 years.

2.2.1 Sand Separating Chamber

Each water desander shall be fabricated of heavy plate steel designed for operating pressures up to 150 psig and hydrostatically tested to 1.5 times the operating pressure. Standard 6 inch flanged inlet and 8 inch flanged outlet connections shall be provided. Inlet and outlet pressure gages shall also be provided. The internal conical section and vortex finder shall be replaceable. The cone section shall be fabricated of heavy steel plate lined with pure gum rubber or fabricated of special abrasion resistant steel plate. The conical section shall be equipped with a tangential sand discharge orifice for discharging sand into the accumulator section at low velocity without swirling action. The accumulator shall have a volume of at least 25 cubic feet.

2.3 SLUICE GATES

Sluice gates will be cast iron, fully bronze mounted and will have side wedges for seating head conditions, and side, top and bottom wedges for unseating head conditions. All gate components will be designed to safely withstand the head listed in the gate schedule below.

No.	Location	QTY	SIZE	HEAD CAPACITY (S)	HEAD CAPACITY (US)	OPER. HEAD	GEAR RATIO
1	Building 1318 Reservoir	1	24"X24"	60'	30'	**[AM#3]** **12'**	4:1

2.3.1 Materials:

All materials shall meet ASTM designations as listed below as a minimum.

Parts	ASTM Designation
Iron casting for wall thimbles, frame disc and stem guides	A-126 Class-B
Bronze Castings for wedges, thrust nuts, lifting nuts and couplings	B-584 C865 or CA873
Bronze for seat facings in frame and disc	B-21, C482 or CA464 or B-98, CA651 or 655
Bronze for fasteners	B-98, C655
Stainless steel for stems	A-276 Type 304
Stainless steel for fasteners	F-593 or F-594

2.3.2 Frame:

The frame will be of cast iron, of ample section and one-piece construction with mounting flange and rectangular opening as specified on the Plans. All contact surfaces of the frame will be machined. The frame will have machined dovetailed grooves on the front face into which bronze seat facings shall be driven and machined to a 63 micro-inch finish. The back of the frame will be machined to bolt directly to the machined face of the wall thimble.

2.3.3 Disc:

The disc will be of cast iron, one-piece construction, rectangular with integrally cast vertical and horizontal ribs. A reinforcing rib along each side will be provided to insure rigidity between the side wedges. The disc will have machined dovetailed grooves on the seating face into which bronze seat facings shall be driven and machined to a 63 micro-inch finish. A tongue on each side, extending the full length of the disc, will be machined on all sides with a 1/16" clearance maintained between the disc tongue and the gate guide groove. Wedge pads for side wedges and for top

and bottom wedges will be cast integrally on the disc and machined to receive the adjustable bronze wedges. A heavily reinforced nut pocket will be cast integrally on the vertical centerline and above the horizontal center and be of such shape to receive the square-backed thrust nut.

2.3.4 Guides:

Guide will be cast iron, one-piece, designed to withstand the total thrust due to the water pressure and the wedging action. The guides shall be machined on all contact surfaces and a groove will be machined the entire length of the guide to allow 1/16" clearance between the disc tongue and the guide groove. The guides will be of such length as to retain and support at least one-half the disc in the full open position and will be integrally cast with or attached to the frame with silicon bronze or stainless steel studs and nuts. They shall be dowelled to prevent any relative motion between the guides and the frame.

2.3.5 Wedges:

The wedges shall be made of solid cast bronze and machined on all contact surfaces. They shall be attached to the disc with studs and nuts and will have adjusting screws with lock nuts.

2.3.6 Seat Facings:

All seat facings will be malleable extruded bronze of a composition which will increase in wearing ability with cold working. The extruded seat facings will be of a special shape to fill and permanently lock in the machined dovetailed grooves when driven into place. Attaching pins and screws will not be allowed. The installed seat facings will be machined to a 63 micro-inch finish or better.

2.3.7 Wall Thimbles:

Wall thimbles shall be furnished for all sluice gates. They will be cast iron, one-piece construction, of adequate section modulus to withstand all operational and reasonable installation stresses. Wall thimbles will be internally braced during concrete placement. A center ring or water stop will be cast around the periphery of the thimble. The front flange will be machined and have tapped holes for the sluice gate attaching studs. The word "top" shall be metal stamped along with a center line for correct alignment.

2.3.8 Stems:

The operating stems shall be of a size to safely withstand, without buckling or permanent distortion, the stressed induced by normal operating forces. In addition, the stem will be designed to transmit in compression at least 2 1/2 times the rated output of the floorstand supplied, with a 40 lb. effort on the crank. The threaded portion of the stem shall have machine cut threads of the 29° Acme type. The stems shall be joined with bronze couplings threaded and keyed to the stems. All threaded and keyed couplings of the same size shall be interchangeable. Manually operated, rising stem gates will be provided with an adjustable stop collar on the stem above the floorstand lift nut.

2.3.9 Stem Guides:

Stem guides shall be cast iron, bronze bushed, mounted on cast iron brackets. They shall be adjustable in two directions and will be spaced at sufficient intervals to adequately support the stems. Stem guide spacing will not exceed an L/r ratio of 200 and will not be spaced greater than 10 ft. except where required for gate travel.

2.3.10 Floorstand Operators:

Floorstand operators shall be either single or double gear reduction type depending upon the lifting capacity required and as specified. Each type shall be provided with a threaded cast bronze lift nut to engage the operating stem. Roller bearings shall be provided above and below a flange on the operating nut to support both the opening and closing thrusts. The operator shall open or close the gates under the specified operating head with no greater than a 40 lb pull on the crank. Gears, where required, will be steel with machine-cut teeth designed for smooth operation. The stainless steel pinion shafts on the crank operated floorstands, whether single or double ratio, shall be supported on tapered roller bearings or needle bearings. All components shall be totally enclosed in a cast iron case and cover. Positive mechanical seals shall be provided on the operating nut and the pinion shaft to exclude moisture and dirt and prevent leakage of lubricant out of the hoist. Lubricating fittings will be provided for the lubricating fittings will be provided for the lubrication of all gears and bearings. Removable crank will be designed for rough treatment and minimum weight.

2.3.11 Floorstand Stem Covers:

Floorstand stem covers shall be provided for all operators. They shall be marked clearly with graduations indicating the position of the gate. They shall be translucent or clear, durable and not effected by cold or sun light. Covers shall be made of LEXAN.

2.3.12 Cleaning and Painting:

Surfaces shall be cleaned to Steel Structures Painting Council (SSPC) SP-10, dry and free of grease before painting. All surfaces shall be primed and finish coated in the manufacture's shop with a minimum of 10 mils dry film thickness (DFT) of a high-solids epoxy coating approved for use in potable water by an ANSI certified agency. After painted surfaces are dried, the machined or bearing surfaces and the holes, both plain and threaded, shall be coated with a protective grease until time of installations. The surfaces of the wall thimble in contact with concrete shall remain uncoated.

2.3.13 Leakage:

All sluice gates will be substantially watertight under the design head conditions. The leakage shall not exceed 0.1 GPM per foot of periphery.

PART 3 EXECUTION

3.1 INSTALLATION

Install products as per manufacturer's written instructions.

-- End of Section --

SOIL STRATIGRAPHY

Area "D", Logan Heights

The soil encountered at this site may be grouped into a single generalized stratum. This stratum consists of silty, gravelly fine grained sand intermixed with varying amount of calcareous materials. This soil was encountered at a dry to moist conditions and at a very dense relative density, with Standard Penetration Test (SPT) results of more than 50 blows per foot of penetration. This stratum was encountered from the surface to the depth of auger refusal of 16.5 ft.

Area "C", Biggs Field

The soils encountered at this site may be grouped into two generalized strata, each with similar physical properties.

StratumI consists of brown, fine grained silty sand intermixed with varying amount of gravel and calcareous material. This stratum was encountered from the top of boring elevations to a total depth of 30 ft. below ground surface elevation. This soil was encountered at a loose to very dense relative density, with SPT results ranging from 7 to more than 48 blows per foot of penetration.

Stratum II consists of brown clay. This soil was encountered interbedded within the Stratum I soil described above. This soil was encountered at a depth of 9 ft and extends to a depth of 12 ft below existing surface elevation. This soil was encountered at a stiff to very stiff consistency and at a moist condition.

Area "J", Dona Ana Range

The soils encountered at this site may be grouped into two generalized strata, each with similar physical properties.

StratumI consists of brown, fine grained silty sand intermixed with varying amount of gravel and calcareous material. This stratum was encountered from the top of boring elevations to the termination depth of 50 feet. This soil was encountered at a loose to very dense relative density, with SPT results ranging from 7 to more than 50 blows per foot of penetration.

Stratum II consists of brown clay. This soil was encountered interbedded within the Stratum I soil described above. This soil was encountered at a depth of 7 ft and extends to a depth of 10 ft, below existing surface elevation, and again from a depth of 20 ft and extends to a depth of 25 ft. This soil was encountered at a stiff to very stiff consistency and at a moist condition.

Area "K", Oro Grande Range

The subsurface soil encountered in this site consists of igneous rhyolitic bedrock. Soil deposit consisting of gravel and silty sand was encountered overlying the rock layer. Highly weathered rock layer was encountered at a depth of 12 inches and extend to an

approximate depth of 2.5 feet. Highly fractured rock layer was encountered from a depth of 2.5 feet and extends to the termination depth of 11.5 feet.