

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>				1. CONTRACT ID CODE <b>J</b>	PAGE OF PAGES <b>1   2</b>
2. AMENDMENT/MODIFICATION NO. <b>0005</b>	3. EFFECTIVE DATE <b>23-Jan-2003</b>	4. REQUISITION/PURCHASE REQ. NO. <b>W26GLG-2317-3482</b>	5. PROJECT NO.(If applicable) <b>MUHJ 023010</b>		
6. ISSUED BY CONTRACTING OFFICE (CA/CW) US ARMY ENGR DIST NORFOLK ATTN: CENAO-SS-C 803 FRONT STREET NORFOLK VA 23510-1096	CODE <b>DACA65</b>	7. ADMINISTERED BY (If other than item 6) <b>See Item 6</b>		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				<input checked="" type="checkbox"/>	9A. AMENDMENT OF SOLICITATION NO. <b>DACA65-03-R-0007</b>
				<input checked="" type="checkbox"/>	9B. DATED (SEE ITEM 11) <b>10-Dec-2002</b>
					10A. MOD. OF CONTRACT/ORDER NO.
					10B. DATED (SEE ITEM 13)
CODE	FACILITY CODE				
<b>11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS</b>					
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input checked="" type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offer 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 _____ 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 you 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)					
<b>13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.</b>					
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 <input type="checkbox"/> is not, <input type="checkbox"/> 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.) <b>AMENDMENT NO. 0005 to DACA65-03-R-0007, OPERATIONS SUPPORT CENTER, LANGLEY AIR FORCE BASE, VA.</b>					
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)		
			TEL: _____ EMAIL: _____		
15B. CONTRACTOR/OFFEROR  _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA  BY _____ (Signature of Contracting Officer)		16C. DATE SIGNED  <b>23-Jan-2003</b>	

## SECTION SF 30 BLOCK 14 CONTINUATION PAGE

**The following items are applicable to this modification:**CONTINUATION

1. PROPOSAL DUE DATE IS HEREBY EXTENDED TO FEBRUARY 6, 2003 at 11:00 am. Proposals to be delivered to U.S. Army Engineer, Norfolk, 803 Front Street, ATTN: CENAO-SS-C, Norfolk, VA 23510-1096.
2. SECTION 00010, DELETE Bidding Schedule in its entirety and REPLACE with the attached.
3. SECTION 00120, DELETE the header "Renovate of Building 34, Defense Supply Center, Richmond, VA" and REPLACE with "Operations Support Center, Langley Air Force Base, VA".
4. Technical Plans and Specifications are amended. Make appropriate changes in accordance with the attached.

Section 00010 - Solicitation Contract Form

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001	SCHEDULE I - BASE FFP Construct Operations Support Center Building, complete, including all work incidental thereto as shown on the drawings and specified exclusive of items 0002 thru 0007.	1	Lump Sum		

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NET AMT

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002	FFP Sitework associated with Operations Support Center Building, complete including demolition of buildings and all work incidental thereto as shown on the drawings and specified exclusive of items 0001 and 0003 thru 0007.	1	Lump Sum		

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NET AMT

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0003		19,992	Square Yard		

FFP

Parking lot pavement associated with the Operations Support Center, complete including parking lot rough grading, curbs & gutters, barriers, landscaping, lighting, and all work incidental thereto as shown on the drawings and specified exclusive of items 0001, 0002, 0004 and 0007.

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NET AMT

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0004		1	Lump Sum		

FFP

Building 15 Loop Road, complete, including all work incidental thereto as shown on the drawings and specified exclusive of bid items 0001 thru 0003 and 0005 thru 0007.

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NET AMT

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0005		1	Lump Sum	30,000.00	30,000.00

FFP

As-Built drawings for Operations Support Center building, complete, including all work incidental thereto as shown on the drawings and specified exclusive of bid items 0001 thru 0004, 0006 and 0007.

30,000.00

NET AMT

TOTAL SCHEDULE I

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0006		1	Lump Sum		

SCHEDULE II - OPTIONAL ITEMS

FFP

Construct finished attic in the Operations Support Center building, complete, including all work incidental thereto as shown on the drawings and as specified exclusive of bid items 0001 thru 0005 and 0007.

NET AMT

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0007		1	Lump Sum		

FFP

Storm drain pipe as shown on Dormitory Loop Road sheet C104A, complete, including all work incidental thereto as shown on the drawings and specified exclusive of bid items 0001 thru 0006.

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NET AMT

TOTAL SCHED II

TOTAL AMOUNT  
PROPOSED

## **SPECIFICATIONS**

DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13720 - ELECTRONIC SECURITY SYSTEM  
REVISED this section.

SECTION 13722 - SOUND MASKING SYSTEM  
REVISED this section.

DIVISION 16 - ELECTRICAL

SECTION 16770 - PUBLIC ADDRESS SYSTEMS  
REVISED this section.

## **DRAWINGS**

**The following drawing sheets have been added:**

C-301A ROADWAY SECTIONS  
C-302A ROADWAY SECTIONS  
C-303A ROADWAY SECTIONS  
C-304A ROADWAY SECTIONS

**The following drawing sheets have been revised, delete the original sheet and add revised sheet:**

E-001 ELECTRICAL LEGEND  
E-108 ELECTRICAL SITE PLAN - LIGHTING AND EXTERIOR DETAILS  
E-202 ELECTRICAL FIRST FLOOR PLAN - AREA B - LIGHTING  
E-203 ELECTRICAL FIRST FLOOR PLAN - AREA C - LIGHTING  
E-206 ELECTRICAL SECOND FLOOR PLAN AREA B - LIGHTING  
E-207 ELECTRICAL SECOND FLOOR PLAN AREA C - LIGHTING  
E-211 ELECTRICAL THIRD FLOOR PLAN - AREA E (OPTION 1) - LIGHTING  
E-212 ELECTRICAL THIRD FLOOR PLAN - AREA F (OPTION 1) - LIGHTING  
E-301 ELECTRICAL FIRST FLOOR PLAN AREA A - POWER  
E-302 ELECTRICAL FIRST FLOOR PLAN AREA B - POWER  
E-303 ELECTRICAL FIRST FLOOR PLAN AREA C - POWER  
E-304 ELECTRICAL FIRST FLOOR PLAN AREA D - POWER  
E-305 ELECTRICAL SECOND FLOOR PLAN AREA A - POWER  
E-306 ELECTRICAL SECOND FLOOR PLAN AREA B - POWER  
E-307 ELECTRICAL SECOND FLOOR PLAN AREA C - POWER  
E-308 ELECTRICAL SECOND FLOOR PLAN AREA D - POWER  
E-311 ELECTRICAL THIRD FLOOR PLAN AREA E (OPTION 1) - POWER  
E-312 ELECTRICAL THIRD FLOOR PLAN AREA F (OPTION 1) - POWER

E-501	ELECTRICAL FIRST FLOOR PLAN AREA A
E-502	ELECTRICAL FIRST FLOOR PLAN AREA B
E-503	ELECTRICAL FIRST FLOOR PLAN AREA C
E-504	ELECTRICAL FIRST FLOOR PLAN AREA D
E-505	ELECTRICAL SECOND FLOOR PLAN AREA A
E-506	ELECTRICAL SECOND FLOOR PLAN AREA B
E-507	ELECTRICAL SECOND FLOOR PLAN AREA C
E-508	ELECTRICAL SECOND FLOOR PLAN AREA D
E-701	ELECTRICAL ONE LINE DIAGRAM - PART A
E-705	RISER DIAGRAM - SECURITY
E-706	IDS ZONING DIAGRAM
E-903	PANELBOARD SCHEDULES
E-904	PANELBOARD SCHEDULES
E-905	PANELBOARD SCHEDULES
E-906	PANELBOARD SCHEDULES
E-907	PANELBOARD SCHEDULES
E-908	PANELBOARD SCHEDULES
E-909	PANELBOARD SCHEDULES
E-910	PANELBOARD SCHEDULES
E-911	PANELBOARD SCHEDULES
E-1002	ELECTRICAL LIGHTING DETAILS
P-202	FIRST FLOOR PLAN - AREA B - PLUMBING
P-204	FIRST FLOOR PLAN - AREA D - PLUMBING
P-402	RISER DIAGRAM

## **SPECIFICATIONS**

DIVISION 02 - SITEWORK

SECTION 02115A - UNDERGROUND STORAGE TANK REMOVAL  
REVISED this section.

DIVISION 08 - DOORS AND WINDOWS

SECTION 08110 - STEEL DOORS AND FRAMES  
REVISED this section.

DIVISION 10 - SPECIALTIES

SECTION 10430A - EXTERIOR SIGNAGE  
REVISED this section.

## **DRAWINGS**

**The following drawing sheets have been revised, delete the original sheet and add revised sheet:**

A-105 FIRST FLOOR PLAN – AREA A  
A-108 FIRST FLOOR PLAN – AREA D  
A-109 SECOND FLOOR PLAN – AREA A  
A-110 SECOND FLOOR PLAN – AREA B  
A-112 SECOND FLOOR PLAN – AREA D  
A-310 WALL SECTION  
A-312 WALL SECTION

CONTRACTOR NOTE:

Certain partition types were changed as part of this addendum. The changes were made to the floor plans to the full extent and to the wall sections where occurs. In this addendum, the changes were not illustrated in the column, door, hollow metal window and other miscellaneous details. These details should be modified to accommodate the new wall construction. Specifically doors A120A, B200B and B200C, and Hollow Metal Frame type 'G' will need to be modified.

**The following drawing sheets have been revised:**

A-101 OVERALL FLOOR PLAN FIRST FLOOR

Add the following partition types to the INTERIOR WALL AND PARTITION SCHEDULE:

8F 8", 16GA METAL STUDS WITH 2 ½" FLANGES AT 12" O.C. PARTITION WITH ½" TYPE 'C' GYPSUM BOARD LATH WITH VENEER PLASTER ONE

SIDE AND 5/8" TYPE 'X' GWB OTHER SIDE. TERMINATE PARTITION AT UNDERSIDE OF METAL DECK.

- 8G 8", 16GA METAL STUDS WITH 2 1/2" FLANGES AT 12" O.C. PARTITION WITH 1/2" GWB ONE SIDE AND 1/2" GYPSUM BOARD LATH WITH VENEER PLASTER OTHER SIDE. TERMINATE PARTITION AT UNDERSIDE OF METAL DECK.
- 8H 8", 16GA METAL STUDS WITH 2 1/2" FLANGES AT 12" O.C. PARTITION WITH 1/2" GYPSUM BOARD LATH WITH VENEER PLASTER ONE SIDE. TERMINATE PARTITION AT UNDERSIDE OF METAL DECK.
- 8J 8", 16GA METAL STUDS WITH 2 1/2" FLANGES AT 12" O.C. PARTITION WITH 1/2" GWB EACH SIDE. TERMINATE PARTITION AT UNDERSIDE OF METAL DECK.

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## SECTION 01850

## CONTRACT DRAWINGS

03/98

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LF-450-1.003	G-003	INDEX OF DRAWINGS
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LF-450-1.096	A-118	FIRST FLOOR REFLECTED CEILING PLAN - AREA B
LF-450-1.097	A-119	FIRST FLOOR REFLECTED CEILING PLAN - AREA C
LF-450-1.098	A-120	FIRST FLOOR REFLECTED CEILING PLAN - AREA D
LF-450-1.099	A-121	SECOND FLOOR REFLECTED CEILING PLAN - AREA A
LF-450-1.100	A-122	SECOND FLOOR REFLECTED CEILING PLAN - AREA B
LF-450-1.101	A-123	SECOND FLOOR REFLECTED CEILING PLAN - AREA C
LF-450-1.102	A-124	SECOND FLOOR REFLECTED CEILING PLAN - AREA D
LF-450-1.103	A-125	ATTIC FLOOR REFLECTED CEILING PLAN - AREA E
LF-450-1.104	A-126	ATTIC FLOOR REFLECTED CEILING PLAN - AREA F
LF-450-1.105	A-127	THIRD FLOOR REFLECT CEILING PLAN - AREA E (OPTION 1)
LF-450-1.106	A-128	THIRD FLOOR REFLECT CEILING PLAN - AREA F (OPTION 1)
LF-450-1.107	A-129	RAISED ACCESS FLOORING PLAN - FIRST FLOOR
LF-450-1.108	A-130	RAISED ACCESS FLOORING PLAN - SECOND FLOOR
LF-450-1.109	A-131	ROOF PLAN
LF-450-1.110	A-201	BUILDING ELEVATIONS
LF-450-1.111	A-301	BUILDING SECTIONS
LF-450-1.112	A-302	BUILDING SECTIONS
LF-450-1.113	A-303	WALL SECTIONS
LF-450-1.114	A-304	WALL SECTIONS
LF-450-1.115	A-305	WALL SECTION
LF-450-1.116	A-306	WALL SECTION
LF-450-1.117	A-307	WALL SECTION
LF-450-1.118	A-308	WALL SECTION
LF-450-1.119	A-309	WALL SECTIONS
LF-450-1.120	A-310	WALL SECTIONS
LF-450-1.121	A-311	WALL SECTION
LF-450-1.122	A-312	WALL SECTION
LF-450-1.123	A-401	ENLARGED STAIR PLANS
LF-450-1.124	A-402	ENLARGED STAIR PLANS AND SECTIONS
LF-450-1.125	A-403	STAIR SECTIONS
LF-450-1.126	A-404	ELEVATOR PLANS AND SECTIONS
LF-450-1.127	A-405	STAIR DETAILS
LF-450-1.128	A-406	STAIR DETAILS
LF-450-1.129	A-407	ELEVATOR DETAILS
LF-450-1.130	A-408	ENLARGED TOILET PLANS
LF-450-1.131	A-409	CASEWORK ELEVATIONS AND SECTIONS
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LF-450-1.133	A-502	COLUMN DETAILS FIRST FLOOR
LF-450-1.134	A-503	COLUMN DETAILS FIRST FLOOR
LF-450-1.135	A-504	COLUMN DETAILS FIRST FLOOR
LF-450-1.136	A-505	COLUMN DETAILS SECOND FLOOR
LF-450-1.137	A-506	COLUMN DETAILS SECOND FLOOR
LF-450-1.138	A-507	COLUMN DETAILS SECOND FLOOR
LF-450-1.139	A-508	COLUMN DETAILS ATTIC
LF-450-1.140	A-509	COLUMN DETAILS THIRD FLOOR (OPTION 1)
LF-450-1.141	A-510	PRECAST PANEL DETAILS
LF-450-1.142	A-511	PRECAST PANEL DETAILS
LF-450-1.143	A-512	ROOF DETAILS
LF-450-1.144	A-513	ROOF DETAILS
LF-450-1.145	A-514	ROOF DETAILS
LF-450-1.146	A-515	MISCELLANEOUS DETAILS
LF-450-1.147	A-516	MISCELLANEOUS DETAILS
LF-450-1.148	A-517	MISCELLANEOUS DETAILS
LF-450-1.149	A-518	MISCELLANEOUS DETAILS
LF-450-1.150	A-519	CANOPY SECTION & DETAILS
LF-450-1.151	A-601	FINISH SCHEDULE

LF-450-1.152	A-602	COLOR SCHEDULE
LF-450-1.153	A-603	DOOR SCHEDULE, ELEVATIONS AND NOTES
LF-450-1.154	A-604	HOLLOW METAL FRAME DOOR AND WINDOW DETAILS
LF-450-1.155	A-605	HOLLOW METAL FRAME DOOR AND WINDOW DETAILS
LF-450-1.156	A-606	HOLLOW METAL FRAME DOOR AND WINDOW DETAILS
LF-450-1.157	A-607	WINDOW SYSTEM ELEVATIONS
LF-450-1.158	A-608	EXTERIOR WINDOW & DOOR DETAILS
LF-450-1.159	A-609	EXTERIOR WINDOW & DOOR DETAILS
LF-450-1.160	A-610	EXTERIOR WINDOW & DOOR DETAILS
LF-450-1.161	A-611	EXTERIOR WINDOW & DOOR DETAILS
LF-450-1.162	A-612	GRAPHIC SIGNAGE
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LF-450-1.167	I-104	SECOND FLOOR FURNITURE PLAN - AREA A
LF-450-1.168	I-105	SECOND FLOOR FURNITURE PLAN - AREA B AND C
LF-450-1.169	I-106	SECOND FLOOR FURNITURE PLAN - AREA D
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LF-450-1.172	F-102	FIRE PROTECTION PLAN SECOND FLOOR
LF-450-1.173	F-103	FIRE PROTECTION PLAN ATTIC
LF-450-1.174	F-104	FIRE PROTECTION PLAN THIRD FLOOR (OPTION 1)
LF-450-1.175	F-105	LEGEND, DETAIL & MECHANICAL PART PLAN - FIRE SUPPRESSION
LF-450-1.176	P-001	LEGEND SCHEDULES NOTES AND ABBREVIATIONS
LF-450-1.177	P-201	FIRST FLOOR PLAN - AREA A - PLUMBING
LF-450-1.178	P-202	FIRST FLOOR PLAN - AREA B - PLUMBING
LF-450-1.179	P-203	FIRST FLOOR PLAN - AREA C - AND MECH. ROOM PART PLAN - PLUMBING
LF-450-1.180	P-204	FIRST FLOOR PLAN - AREA D - PLUMBING
LF-450-1.181	P-205	SECOND FLOOR PLAN - AREA A - PLUMBING
LF-450-1.182	P-206	SECOND FLOOR PLAN - AREA B - PLUMBING
LF-450-1.183	P-207	SECOND FLOOR PLAN - AREA C - PLUMBING
LF-450-1.184	P-208	SECOND FLOOR PLAN - AREA D - PLUMBING
LF-450-1.185	P-209	ATTIC FLOOR PLAN - AREA E - PLUMBING
LF-450-1.186	P-210	ATTIC FLOOR PLAN - AREA F - PLUMBING
LF-450-1.187	P-211	THIRD FLOOR PLAN - AREA E (OPTION 1) - PLUMBING
LF-450-1.188	P-212	THIRD FLOOR PLAN - AREA F (OPTION 1) - PLUMBING
LF-450-1.189	P-301	FIRST FLOOR PART PLANS - TOILET/BREAK ROOMS - PLUMBING
LF-450-1.190	P-302	SECOND FLOOR PART PLANS - TOILET/BREAK ROOMS - PLUMBING
LF-450-1.191	P-303	THIRD FLOOR PART PLANS - TOILET ROOM (OPTION 1) - PLUMBING
LF-450-1.192	P-401	RISER DIAGRAMS
LF-450-1.193	P-402	RISER DIAGRAMS
LF-450-1.194	P-501	PLUMBING DETAILS
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LF-450-1.196	M-101	MECHANICAL SITE PLAN AND COURTYARD PLAN
LF-450-1.197	M-102	MECHANICAL DEMOLITION
LF-450-1.198	M-103	MECHANICAL DEMOLITION
LF-450-1.199	M-104	MECHANICAL DEMOLITION
LF-450-1.200	M-201	MECHANICAL FIRST FLOOR PLAN AREA A - DUCTWORK

LF-450-1.201	M-202	MECHANICAL FIRST FLOOR PLAN AREA B - DUCTWORK
LF-450-1.202	M-203	MECHANICAL FIRST FLOOR PLAN AREA C - DUCTWORK
LF-450-1.203	M-204	MECHANICAL FIRST FLOOR PLAN AREA D - DUCTWORK
LF-450-1.204	M-205	MECHANICAL SECOND FLOOR PLAN AREA A - DUCTWORK
LF-450-1.205	M-206	MECHANICAL SECOND FLOOR PLAN AREA B - DUCTWORK
LF-450-1.206	M-207	MECHANICAL SECOND FLOOR PLAN AREA C - DUCTWORK
LF-450-1.207	M-208	MECHANICAL SECOND FLOOR PLAN AREA D - DUCTWORK
LF-450-1.208	M-209	MECHANICAL ATTIC FLOOR PLAN AREA E - DUCTWORK
LF-450-1.209	M-210	MECHANICAL ATTIC FLOOR PLAN AREA F - DUCTWORK
LF-450-1.210	M-211	MECHANICAL THIRD FLOOR PLAN AREA E (OPTION 1) - DUCTWORK
LF-450-1.211	M-212	MECHANICAL THIRD FLOOR PLAN AREA F (OPTION 1) - DUCTWORK
LF-450-1.212	M-301	MECHANICAL FIRST FLOOR PLAN AREA A - PIPING
LF-450-1.213	M-302	MECHANICAL FIRST FLOOR PLAN AREA B - PIPING
LF-450-1.214	M-303	MECHANICAL FIRST FLOOR PLAN AREA C - PIPING
LF-450-1.215	M-304	MECHANICAL FIRST FLOOR PLAN AREA D - PIPING
LF-450-1.216	M-305	MECHANICAL SECOND FLOOR PLAN AREA A - PIPING
LF-450-1.217	M-306	MECHANICAL SECOND FLOOR PLAN AREA B - PIPING
LF-450-1.218	M-307	MECHANICAL SECOND FLOOR PLAN AREA C - PIPING
LF-450-1.219	M-308	MECHANICAL SECOND FLOOR PLAN AREA D - PIPING
LF-450-1.220	M-309	MECHANICAL ATTIC FLOOR PLAN AREA E - PIPING
LF-450-1.221	M-310	MECHANICAL ATTIC FLOOR PLAN AREA F - PIPING
LF-450-1.222	M-311	MECHANICAL THIRD FLOOR PLAN AREA E (OPTION 1) - PIPING
LF-450-1.223	M-312	MECHANICAL THIRD FLOOR PLAN AREA F (OPTION 1) - PIPING
LF-450-1.224	M-401	MECHANICAL ENLARGED PLANS
LF-450-1.225	M-501	MECHANICAL SCHEDULES
LF-450-1.226	M-502	MECHANICAL SCHEDULES
LF-450-1.227	M-601	MECHANICAL PIPING SCHEMATICS
LF-450-1.228	M-602	MECHANICAL DETAILS
LF-450-1.229	M-603	MECHANICAL DETAILS
LF-450-1.230	M-604	MECHANICAL DETAILS
LF-450-1.231	M-701	MECHANICAL SECTIONS
LF-450-1.232	M-702	MECHANICAL SECTIONS
LF-450-1.233	M-801	MECHANICAL DDC CONTROLS AND SEQUENCE OF OPERATIONS
LF-450-1.234	M-802	MECHANICAL DDC CONTROLS AND SEQUENCE OF OPERATIONS
LF-450-1.235	M-803	MECHANICAL DDC CONTROLS AND SEQUENCE OF OPERATIONS
LF-450-1.236	E-001	ELECTRICAL LEGEND
LF-450-1.237	E-002	EXTERIOR LEGEND AND ABBREVIATIONS
LF-450-1.238	E-003	ELECTRICAL FLOOR PLAN - BUILDING 18 - DEMOLITION - LIGHTING AND POWER
LF-450-1.239	E-004	ELECTRICAL FIRST FLOOR PLAN - BUILDING 21 - DEMOLITION - LIGHTING
LF-450-1.240	E-005	ELECTRICAL FIRST FLOOR PLAN - BUILDING 21 - DEMOLITION - POWER
LF-450-1.241	E-006	ELECTRICAL SECOND FLOOR PLAN - BUILDING 21 - DEMOLITION - LIGHTING
LF-450-1.242	E-007	ELECTRICAL SECOND FLOOR PLAN - BUILDING 21 - DEMOLITION - POWER
LF-450-1.243	E-101	MEDIUM VOLTAGE 22KV ONE LINE DIAGRAM
LF-450-1.244	E-102	ELECTRICAL SITE PLAN - DEMOLITION - POWER
LF-450-1.245	E-103	ELECTRICAL SITE PLAN - DEMOLITION - COMMUNICATIONS

LF-450-1.246	E-104	ELECTRICAL SITE PLAN PART A - NEW WORK - POWER & MECHANICAL/ELECTRICAL COURTYARD PLAN
LF-450-1.247	E-105	ELECTRICAL SITE PLAN PART B - NEW WORK - POWER
LF-450-1.248	E-106	ELECTRICAL SITE PLAN - NEW WORK - COMMUNICATIONS
LF-450-1.249	E-107	ELECTRICAL EXTERIOR DETAILS
LF-450-1.250	E-108	ELECTRICAL SITE PLAN - LIGHTING
LF-450-1.251	E-109	ELECTRICAL EXTERIOR DETAILS
LF-450-1.252	E-110	COMMUNICATIONS MANHOLE DETAILS
LF-450-1.253	E-111	POWER MANHOLE DETAILS
LF-450-1.254	E-112	OVERHEAD ELECTRICAL POLE DETAILS
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LF-450-1.257	E-201	ELECTRICAL FIRST FLOOR PLAN AREA A - LIGHTING
LF-450-1.258	E-202	ELECTRICAL FIRST FLOOR PLAN AREA B - LIGHTING
LF-450-1.259	E-203	ELECTRICAL FIRST FLOOR PLAN AREA C - LIGHTING
LF-450-1.260	E-204	ELECTRICAL FIRST FLOOR PLAN AREA D - LIGHTING
LF-450-1.261	E-205	ELECTRICAL SECOND FLOOR PLAN AREA A - LIGHTING
LF-450-1.262	E-206	ELECTRICAL SECOND FLOOR PLAN AREA B - LIGHTING
LF-450-1.263	E-207	ELECTRICAL SECOND FLOOR PLAN AREA C - LIGHTING
LF-450-1.264	E-208	ELECTRICAL SECOND FLOOR PLAN AREA D - LIGHTING
LF-450-1.265	E-209	ELECTRICAL ATTIC FLOOR PLAN AREA E - LIGHTING
LF-450-1.266	E-210	ELECTRICAL ATTIC FLOOR PLAN AREA F - LIGHTING
LF-450-1.267	E-211	ELECTRICAL THIRD FLOOR PLAN AREA E (OPTION 1) - LIGHTING
LF-450-1.268	E-212	ELECTRICAL THIRD FLOOR PLAN AREA F (OPTION 1) - LIGHTING
LF-450-1.269	E-301	ELECTRICAL FIRST FLOOR PLAN AREA A - POWER
LF-450-1.270	E-302	ELECTRICAL FIRST FLOOR PLAN AREA B - POWER
LF-450-1.271	E-303	ELECTRICAL FIRST FLOOR PLAN AREA C - POWER
LF-450-1.272	E-304	ELECTRICAL FIRST FLOOR PLAN AREA D - POWER
LF-450-1.273	E-305	ELECTRICAL SECOND FLOOR PLAN AREA A - POWER
LF-450-1.274	E-306	ELECTRICAL SECOND FLOOR PLAN AREA B - POWER
LF-450-1.275	E-307	ELECTRICAL SECOND FLOOR PLAN AREA C - POWER
LF-450-1.276	E-308	ELECTRICAL SECOND FLOOR PLAN AREA D - POWER
LF-450-1.277	E-309	ELECTRICAL ATTIC FLOOR PLAN AREA E - POWER
LF-450-1.278	E-310	ELECTRICAL ATTIC FLOOR PLAN AREA F - POWER
LF-450-1.279	E-311	ELECTRICAL THIRD FLOOR PLAN AREA E (OPTION 1) - POWER
LF-450-1.280	E-312	ELECTRICAL THIRD FLOOR PLAN AREA F (OPTION 1) - POWER
LF-450-1.281	E-401	ELECTRICAL FIRST FLOOR PLAN AREA A - COMMUNICATIONS
LF-450-1.282	E-402	ELECTRICAL FIRST FLOOR PLAN AREA B - COMMUNICATIONS
LF-450-1.283	E-403	ELECTRICAL FIRST FLOOR PLAN AREA C - COMMUNICATIONS
LF-450-1.284	E-404	ELECTRICAL FIRST FLOOR PLAN AREA D - COMMUNICATIONS
LF-450-1.285	E-405	ELECTRICAL SECOND FLOOR PLAN AREA A - COMMUNICATIONS
LF-450-1.286	E-406	ELECTRICAL SECOND FLOOR PLAN AREA B - COMMUNICATIONS
LF-450-1.287	E-407	ELECTRICAL SECOND FLOOR PLAN AREA C - COMMUNICATIONS
LF-450-1.288	E-408	ELECTRICAL SECOND FLOOR PLAN AREA D - COMMUNICATIONS
LF-450-1.289	E-409	ELECTRICAL ATTIC FLOOR PLAN AREA E - COMMUNICATIONS

LF-450-1.290	E-410	ELECTRICAL ATTIC FLOOR PLAN AREA F - COMMUNICATIONS
LF-450-1.291	E-411	ELECTRICAL THIRD FLOOR PLAN AREA E - (OPTION 1) COMMUNICATIONS
LF-450-1.292	E-412	ELECTRICAL THIRD FLOOR PLAN AREA F - (OPTION 1) COMMUNICATIONS
LF-450-1.293	E-501	ELECTRICAL FIRST FLOOR PLAN AREA A - SPECIAL SYSTEMS
LF-450-1.294	E-502	ELECTRICAL FIRST FLOOR PLAN AREA B - SPECIAL SYSTEMS
LF-450-1.295	E-503	ELECTRICAL FIRST FLOOR PLAN AREA C - SPECIAL SYSTEMS
LF-450-1.296	E-504	ELECTRICAL FIRST FLOOR PLAN AREA D - SPECIAL SYSTEMS
LF-450-1.297	E-505	ELECTRICAL SECOND FLOOR PLAN AREA A - SPECIAL SYSTEMS
LF-450-1.298	E-506	ELECTRICAL SECOND FLOOR PLAN AREA B - SPECIAL SYSTEMS
LF-450-1.299	E-507	ELECTRICAL SECOND FLOOR PLAN AREA C - SPECIAL SYSTEMS
LF-450-1.300	E-508	ELECTRICAL SECOND FLOOR PLAN AREA D - SPECIAL SYSTEMS
LF-450-1.301	E-509	ELECTRICAL ATTIC FLOOR PLAN AREA E - SPECIAL SYSTEMS
LF-450-1.302	E-510	ELECTRICAL ATTIC FLOOR PLAN AREA F - SPECIAL SYSTEMS
LF-450-1.303	E-511	ELECTRICAL THIRD FLOOR PLAN AREA E (OPTION 1) - SPECIAL SYSTEMS
LF-450-1.304	E-512	ELECTRICAL THIRD FLOOR PLAN AREA F (OPTION 1) - SPECIAL SYSTEMS
LF-450-1.305	E-601	ELECTRICAL FIRST FLOOR PLAN AREA A - UNDER RAISED FLOOR CABLE TRAY
LF-450-1.306	E-602	ELECTRICAL FIRST FLOOR PLAN AREA B - UNDER RAISED FLOOR CABLE TRAY
LF-450-1.307	E-603	ELECTRICAL FIRST FLOOR PLAN AREA C - UNDER RAISED FLOOR CABLE TRAY
LF-450-1.308	E-604	ELECTRICAL FIRST FLOOR PLAN AREA D - UNDER RAISED FLOOR CABLE TRAY
LF-450-1.309	E-605	ELECTRICAL SECOND FLOOR PLAN AREA A - UNDER RAISED FLOOR CABLE TRAY
LF-450-1.310	E-606	ELECTRICAL SECOND FLOOR PLAN AREA B - UNDER RAISED FLOOR CABLE TRAY
LF-450-1.311	E-607	ELECTRICAL SECOND FLOOR PLAN AREA C - UNDER RAISED FLOOR CABLE TRAY
LF-450-1.312	E-608	ELECTRICAL SECOND FLOOR PLAN AREA D - UNDER RAISED FLOOR CABLE TRAY
LF-450-1.313	E-609	ENLARGED SERVER FARM ROOM B100 PLAN - POWER
LF-450-1.314	E-610	ENLARGED SERVER FARM ROOM B100 PLAN - COMMUNICATIONS
LF-450-1.315	E-611	ENLARGED COMMUNICATIONS PLANS
LF-450-1.316	E-701	ELECTRICAL ONE LINE DIAGRAM - PART A
LF-450-1.317	E-702	ELECTRICAL ONE LINE DIAGRAM - PART B
LF-450-1.318	E-703	RISER DIAGRAMS - NIPRNET/PHONE UNCLASSIFIED AND SIPRINET CLASSIFIED
LF-450-1.319	E-704	RISER DIAGRAMS - CENTIX AND JWICS AND RED SWITCH
LF-450-1.320	E-705	RISER DIAGRAMS - SECURITY
LF-450-1.321	E-706	IDS ZONING DIAGRAMS
LF-450-1.322	E-707	RISER AND ZONING DIAGRAMS - SOUND MASKING SYSTEM
LF-450-1.323	E-708	RISER DIAGRAMS - FIRE ALARM AND PUBLIC ADDRESS

LF-450-1.324	E-709	GROUNDING AND WIRING DIAGRAMS
LF-450-1.325	E-710	DIAGRAMS AND DETAILS - CCTV
LF-450-1.326	E-711	FLOOR/WALL PENETRATION REQUIREMENT PLANS
LF-450-1.327	E-801	ELECTRICAL DETAILS
LF-450-1.328	E-802	ELECTRICAL DETAILS
LF-450-1.329	E-803	ELECTRICAL DETAILS
LF-450-1.330	E-804	ELECTRICAL DETAILS
LF-450-1.331	E-805	ELECTRICAL DETAILS
LF-450-1.332	E-806	ELECTRICAL DETAILS
LF-450-1.333	E-901	SWITCHBOARD SCHEDULES AND ELEVATIONS
LF-450-1.334	E-902	SWITCHBOARD SCHEDULE AND ELEVATION
LF-450-1.335	E-903	PANELBOARD SCHEDULES
LF-450-1.336	E-904	PANELBOARD SCHEDULES
LF-450-1.337	E-905	PANELBOARD SCHEDULES
LF-450-1.338	E-906	PANELBOARD SCHEDULES
LF-450-1.339	E-907	PANELBOARD SCHEDULES
LF-450-1.340	E-908	PANELBOARD SCHEDULES
LF-450-1.341	E-909	PANELBOARD SCHEDULES
LF-450-1.342	E-910	PANELBOARD SCHEDULES
LF-450-1.343	E-911	PANELBOARD SCHEDULES
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LF-450-1.345	E-1002	ELECTRICAL LIGHTING DETAILS
LF-450-1.346	E-1101	LIGHTNING PROTECTION PLAN AND LEGEND
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LF-450-1.350	E-1105	LEGEND, DETAIL & MECHANICAL PART PLAN - FIRE SUPPRESSION
	G-001A	COVER SHEET
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	C-201A	ROADWAY PROFILE
	C-301A	ROADWAY SECTIONS
	C-302A	ROADWAY SECTIONS
	C-303A	ROADWAY SECTIONS
	C-304A	ROADWAY SECTIONS
	C-501A	SITE DETAILS
	C-502A	SITE DETAILS
	C-503A	SITE DETAILS AND ROADWAY TYPICAL SECTIONS
	C-504A	EROSION & SEDIMENT CONTROL DETAILS
	C-701A	SIGNAL PLAN
	L-101A	LANDSCAPING PLAN
	L-102A	LANDSCAPING PLAN
	L-501A	LANDSCAPE PLANTING DETAILS

E-101A	ELECTRICAL LEGEND AND ABBREVIATIONS
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E-502A	ELECTRICAL DETAILS
E-503A	ELECTRICAL DETAILS

-- End of Section --

## SECTION 02115A

UNDERGROUND STORAGE TANK REMOVAL  
02/02

## PART 1 GENERAL

## 1.1 REFERENCES

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

## AMERICAN PETROLEUM INSTITUTE (API)

API Pub 2217A	(1997) Guidelines for Work in Inert Confined Spaces in the Petroleum Industry
API Pub 2219	(1999) Safe Operation of Vacuum Trucks in Petroleum Service, 2nd Edition
API RP 1604	(1996) Closure of Underground Petroleum Storage Tanks
API RP 2003	(1998) Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents
API Std 2015	(1994) Safe Entry and Cleaning of Petroleum Storage Tanks

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	(2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method
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 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(2000) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996e1) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996e1) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

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

40 CFR 261	Identification and Listing of Hazardous
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## Waste

40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 279	Standards for the Management of Used Oil
40 CFR 280	Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)

## 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-03 Product Data

Work Plan; G.

The Work Plan within 30 days after notice to proceed. The Contractor shall allow 30 days in the schedule for the Government's review and approval. No adjustment for time or money will be made for resubmittals required as a result of noncompliance.

Qualifications; G.

A document indicating that the Contractor meets the specified requirements.

Salvage Rights; G FIO.

A record of the disposition of salvaged materials at the end of the contract.

## SD-06 Test Reports

Backfill Material; G.

Tank Contents Verification; G.

Contaminated Water Disposal; G.

Soil Examination, Testing, and Analysis; G.

Reports including the chain-of-custody records.

Backfilling; G.

Copies of all laboratory and field test reports.

Tank Closure Report; G.

Three copies of the report for each UST site opened, prepared in a standard 3-ring binder, within 14 days of completing work at each site. Each binder shall be labeled with contract number, project name, location and tank number; each binder shall be indexed. A copy of the report shall be furnished to the Installation Environmental Coordinator.

### 1.3 QUALIFICATIONS

The Contractor shall have a minimum of 2 years of tank removal experience and shall be certified by the State of Virginia for tank removal work.

#### 1.3.1 Laboratory Services

For laboratory services the Contractor shall be validated in accordance with state certification requirements.

#### 1.3.2 Support Staff

The Contractor shall identify all staff involved for the various components, including personnel collecting and shipping samples. The qualifications of these staff members shall be detailed by the Contractor.

### 1.4 REGULATORY REQUIREMENTS

#### 1.4.1 Permits and Licenses

The Contractor, as required or as directed by the Contracting Officer, shall obtain local, state, or federal permits and licenses that directly impact the Contractor's ability to perform the work prior to commencing removal operations.

#### 1.4.2 Statutes and Regulations

Tank closures shall be carried out in accordance with 40 CFR 280, 40 CFR 262, 40 CFR 264, and 40 CFR 265 as well as the applicable City of Hampton and State of Virginia regulations. Petroleum contaminated waste shall be transported in accordance with State of Virginia Regulations.

### 1.5 PROJECT/SITE CONDITIONS

The work shall consist of removal, decontamination and disposal of two, 1,000 gallon underground storage tank and associated piping and ancillary equipment. The tanks are constructed of steel and are at the location shown on the drawings. The 1,000 gallon tank at Building 18 was used for storing fuel oil and was taken out of service in 1995. The 1,000 gallon fuel oil tank at Building 21 is in active use. Residue remaining in the tanks is considered a petroleum contaminated waste. Existing native soils are predominantly clayey sand. Groundwater has been encountered within 8 feet of the surface. The Contractor shall verify the actual conditions

prior to submitting a bid. The site is not a hazardous waste site but shall be given special consideration due to the nature of the materials and hazards present until closure activities are complete.

#### 1.5.1 Sequencing and Scheduling

The Contractor shall notify the Installation Environmental Coordinator 764-1129 and the Contracting Officer 10 days prior to tank removal. The Contractor shall be responsible for contacting the Implementation Agency (IA) in accordance with the applicable reporting requirements.

#### 1.5.2 Work Plan

The Contractor shall develop, implement, maintain, and supervise as part of the work, a comprehensive plan for tank removal and related operations. As a minimum the plan shall include, but not be limited to, excavation, removal, and ultimate disposal of the tank, its contents, and any contaminated materials. The Work Plan shall be based on work experience, on the requirements of this specification, and on the following references:

- a. API RP 1604.
- b. API Std 2015.
- c. API RP 2003.
- d. API Pub 2217A.
- e. API Pub 2219.

No work at the site, with the exception of site inspections and mobilization, shall be performed until the Work Plan is approved. At a minimum, the Work Plan shall include:

- a. Discussion of the removal approach, tank cleaning, and tank cutting procedures.
- b. A Sampling and Analysis Plan.
- c. Methods to be employed for product, sludge, vapor, and pumpable liquid removal; purging and inerting; and storage methods proposed for control of surface water.
- d. Treatment options.
- e. Identification of waste, tank and contaminated soil transporters and means of transportation.
- f. Treatment, disposal, and alternate facilities, and means of treatment, disposal or remediation.
- g. Borrow source.
- h. Spill prevention plan.
- i. Spill contingency plan.
- j. Decontamination procedures, shoring plan, and safety measures.

## PART 2 PRODUCTS

## 2.1 BACKFILL MATERIAL

Backfill material shall be obtained from off-site. Backfill shall be classified in accordance with ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, or SC, and shall be free from roots and other organic matter, trash, debris, snow, ice or frozen materials. If off-site materials are used, soil classification test results shall be approved prior to bringing the material onsite. The testing frequency for backfill material shall be 1 per 1000 cubic yards or a minimum of 1 test. Non-contaminated material removed from the excavation shall be used for backfill in accordance with Paragraph BACKFILLING.

## PART 3 EXECUTION

## 3.1 GENERAL REQUIREMENTS

## 3.1.1 Safety Guidelines

Personnel shall abide by the safety guidelines specified in this contract.

## 3.1.2 Burning and Explosives

Use of explosives or burning debris will not be allowed.

## 3.1.3 Protection of Existing Structures and Utilities

The Contractor shall take all necessary precautions to avoid damage to existing structures, their appurtenances, monitoring wells, or utilities that may be affected by work activities. Any damage to utilities resulting from the Contractor's operations shall be repaired at no expense to the Government. The Contractor shall coordinate with the installation to locate underground utilities prior to beginning construction. Utilities encountered which were not previously shown or otherwise located shall not be disturbed without approval from the Contracting Officer.

## 3.1.4 Shoring

Shoring requirements shall be provided in accordance with Section 01351A SAFETY, HEALTH, AND EMERGENCY RESPONSE (HTRW/UST).

## 3.2 TANK CONTENTS VERIFICATION

Sampling and analysis shall be conducted in accordance with the approved Sampling and Analysis Plan.

## 3.2.1 Sampling

Tank product shall be sampled by the Contractor. If the data is not adequate, additional sampling and analysis to the extent required by the approved permitted treatment, storage or disposal (TSD) facility receiving the material shall be the responsibility of the Contractor. Meeting all regulatory requirements, including the preparation of hazardous materials and waste for transportation shall be the responsibility of the Contractor.

## 3.2.2 Analysis

Tank contents shall be tested by the Contractor for the parameters listed

herein. Analyses shall include total petroleum hydrocarbons (TPH), benzene, ethylbenzene, toluene and xylene (BETX), lead Diesel Range Organics (DRO) and Gasoline Range Organics (GRO).

### 3.2.3 Characterization

Prior to removing any of the tank contents, the contents shall be characterized to determine if the tank contents must be disposed as a hazardous waste based on local, state, and Federal disposal regulations. Tank product, pumpable liquids, and sludge shall be characterized in accordance with 40 CFR 261 and 40 CFR 279. The waste contents determination and accompanying test results for each phase present in the tank shall be submitted to the Contracting Officer.

### 3.3 CLEARING, GRUBBING AND REMOVALS

Clearing and grubbing shall be in accordance with Section 02230A CLEARING AND GRUBBING as required and directed by the Contracting Officer shall be cleared of all trees, stumps, down timber, brush, rubbish, roots larger than 3 inches in diameter, and matted roots prior to commencing operations. Concrete or asphalt pavement shall be saw cut at the limits of removal, broken and removed with the resulting debris disposed off Government Property.

### 3.4 TOPSOIL

Uncontaminated topsoil shall be stripped and stockpiled separately for reuse at the location shown if it meets the requirements of clean fill given in Paragraph BACKFILLING. Additional topsoil in excess of that produced by excavation shall be obtained off-site. All areas disturbed by tank removal operations, other than areas to receive pavement or similar surface under this contract, shall be topsoiled.

### 3.5 PREPARATIONS FOR EXCAVATION

Before excavating, the Contractor shall drain product piping back to the tank, remove residual liquids trapped in the product lines and remove all product from the tank; and the tank shall be purged and vented in accordance with API RP 1604, and as specified herein.

#### 3.5.1 Removal of Product, Pumpable Liquids, and Sludge

Tank product, pumpable liquids, and sludge shall be contained, and stored onsite, prior to disposal. Contaminated water shall be treated as specified. Tank product, pumpable liquids, and sludge shall be analyzed and segregated to recover reusable products by the Contractor prior to being transported to the treatment, storage and disposal (TSD) facility. The Contractor shall be responsible for obtaining all required permits. Usable product shall be the property of the Contractor. The Contractor shall provide approved containers, vehicles, equipment, labor, signs, labels, placards and manifests and associated land disposal restriction notices and notifications, necessary for accomplishment of the work, including materials necessary for cleaning up spills that could occur from tank removal operations.

#### 3.5.2 Contaminated Water Disposal

##### 3.5.2.1 Sampling, Analysis, and Containment

Contaminated water shall be sampled and analyzed both prior to and after treatment. Analysis for contaminated water to be taken to an off-site treatment facility shall conform to the requirements of the treatment facility with documentation of all analyses performed furnished to the Contracting Officer in accordance with paragraph RECORDS. Contaminated water shall be contained, stored onsite, and analyzed and disposed of by the Contractor in accordance with applicable Federal and state disposal regulations. The Contractor shall provide approved containers, vehicles, equipment, labor, signs, labels, placards and manifests and associated land disposal notices and notifications, necessary for accomplishment of the work.

#### 3.5.2.2 Treatment

Contaminated water shall be treated off-site by oil water separation filtering and activated carbon or other means as approved by the Contracting Officer. If contaminated water is to be treated onsite, the proposed treatment shall be specified in the Work Plan and submitted for approval. Temporary storage and treatment equipment shall be installed in the general vicinity of the tanks at a location approved by the Contracting Officer.

#### 3.6 PURGING AND INERTING

After the tank and piping contents have been removed, but prior to excavation beyond the top of the tank, the Contractor shall disconnect all the piping (except the piping needed to purge or inert the tank). Flammable and toxic vapors shall be purged from the tank or the tank made inert in accordance with API RP 1604, with the exceptions that filling with water shall not be used and, if dry ice is employed, the Contractor shall use a minimum of 3 pounds per 100 gallons of tank volume. The tank atmosphere shall be continuously monitored for combustible vapors if the tank is purged, or continuously monitored for oxygen if the tank is inerted.

#### 3.7 EXCAVATION

Excavation areas, as well as work near roadways, shall be marked.

##### 3.7.1 Exploratory Trenches

Exploratory trenches shall be excavated as necessary to determine the tank location, limits and the location of ancillary equipment.

##### 3.7.2 Tank Excavation

Excavation around the perimeter of the tank shall be performed limiting the amount of potentially petroleum contaminated soil that could be mixed with previously uncontaminated soil. Petroleum contaminated soil shall be segregated in separate stockpiles. The Contractor shall maintain around the tank an excavation of sufficient size to allow workers ample room to complete the work, but also protect the workers from sliding or cave-ins. Sheet piling, bracing, or shoring shall be installed in the absence of adequate side slopes if there is a need for workers to enter the excavated area. Surface water shall be diverted to prevent direct entry into the excavation. Dewatering of the excavation may require a discharge permit by the State and shall be limited to allow adequate access to the tank and piping, to assure a safe excavation, and to ensure that compaction and moisture requirements are met during backfilling. Dewatering may result in the production of petroleum contaminated water and/or free product. Free

product shall be recovered from the groundwater only as part of necessary dewatering.

### 3.7.3 Piping Excavation

Excavation shall be performed as necessary to remove tank piping and ancillary equipment in accordance with paragraphs: Shoring, Tank Excavation, and Open Excavations.

### 3.7.4 Open Excavations

Open excavations and stockpile areas shall be secured while awaiting confirmation test results from the soil beneath the tank. The excavation shall be backfilled as soon as possible after tank and contaminated soil removals have been completed and confirmation samples have been taken. The Contractor shall divert surface water around excavations to prevent water from directly entering into the excavation.

### 3.7.5 Stockpiles

Uncontaminated excavated soil and petroleum contaminated soil that is not a state-regulated hazardous waste shall be stockpiled and used for backfill in the tank excavation prior to using borrow material. Excavated material that is regulated by the state as a hazardous waste which is visibly stained and which has an obvious petroleum odor or as required by the State of Virginia or implementing agency shall be considered contaminated and shall be placed in containers such as drums, roll-offs or dumpsters for sampling in accordance with paragraph Stockpiled Material Sampling. Uncontaminated soil shall be stockpiled separately from the contaminated soil, a safe distance away from, but adjacent to, the excavation. Allowable stockpiles of contaminated soil shall be placed on an impermeable geomembrane a minimum of 3 layers, each 30 mils thick, and covered with a 10 mils sheet of geomembrane as specified. The geomembrane shall be placed to prevent the stockpiled soil from coming into contact with surface water run-off. The geomembrane cover shall prevent rain or surface water from coming into contact with the contaminated soil, as well as limit the escape of the volatile constituents in the stockpile.

## 3.8 REMOVAL OF PIPING, ANCILLARY EQUIPMENT, AND TANK

### 3.8.1 Piping and Ancillary Equipment

All piping and ancillary equipment shall be disconnected from the tank. The piping shall be removed to the exterior surface of the tank, where it shall be capped and abandoned in place or as directed by the Contracting Officer. All tank ancillary equipment and piping connections shall be capped, except those connections necessary to inert the tank within the excavation zone. The piping exterior and ancillary equipment shall be cleaned to remove all soil and inspected for signs of corrosion and leakage. The Contractor shall ensure no spillage of the piping contents occurs, as specified in the Work Plan, and as required in paragraph SPILLS.

If the soil under and around the tank pad is contaminated, the tank pad shall be removed and disposed of off-site at an approved non-hazardous, hazardous waste facility.

### 3.8.2 Tank

The tank shall be removed from the excavation and the exterior cleaned to remove all soil and inspected for signs of corrosion, structural damage, or

leakage. All materials coming into contact with the tank, or in the vicinity of the excavation such as shovels, slings and tools shall be of the non-sparking type. After removal from the excavation, the tank shall be placed on a level surface at an approved location and secured with wood blocks to prevent movement.

### 3.8.3 Contaminated Soil, Tank and Piping Excavation Examination

After the tank has been removed from the ground, the adjacent and underlying soil shall be examined for any evidence of leakage. The soil shall be visually inspected for staining after removal of all obviously contaminated soil, then screened for the presence of volatile and/or semi-volatile contamination using a real time vapor monitoring instrument. Uncontaminated soil or petroleum contaminated soil not regulated by the state as hazardous waste shall be stockpiled onsite per paragraph Stockpiles.

Contaminated soil or suspected contaminated soil shall be containerized, or, if the site is a RCRA-designated CAMU, stockpiled until further disposition. The Contracting Officer shall determine the extent of the contaminated soil to be removed from each site but shall not exceed 10, 13 cubic yards per site. The Contractor shall report any evidence indicating that the amount of contaminated soil may exceed the individual site limit specified, to the Contracting Officer the same day it is discovered. If minimal additional excavation is required, the Contracting Officer may allow the Contractor to proceed. If extensive contamination is encountered, the excavation shall be sampled and backfilled in accordance with paragraph BACKFILLING. After the known contaminated soil is removed, the excavation shall be sampled and analyzed.

## 3.9 TANK CLEANING

### 3.9.1 Exterior

Soil shall be removed from the exterior of the tank, piping, and associated equipment to eliminate soil deposition on roadways during transportation to a temporary storage area, ensure markings will adhere to the surfaces, and simplify tank cutting. Soil shall be removed using non-sparking tools. Removed uncontaminated soil and soil not regulated by the state as a hazardous waste shall be recovered and used as backfill in the former tank excavation or disposed of onsite. Soil believed to be contaminated shall be removed and containerized, or if the site is a RCRA designated CAMU, collected on 3 layers of 30 mil impermeable geomembrane and stockpiled with other contaminated soil removed from the excavation.

### 3.9.2 Temporary Storage

If the tank is stored after the tank exterior is cleaned and ancillary equipment is removed, and prior to being cut into sections, the tank shall be labeled as directed in API RP 1604, placed on blocks, and temporarily stored in the area of the existing tank site. Prior to cleaning the tank interior the tank atmosphere shall be monitored for combustible vapors and purged or inerted if combustible vapors are detected.

### 3.9.3 Interior

The tank interior shall be cleaned using a high pressure (greater than 500 psi), low volume (less than 2 gpm) water spray or steam cleaned until all loose scale and sludge is removed, and contamination, in the form of a sheen, is no longer visible in the effluent stream. The interior surfaces of piping shall also be cleaned, to the extent possible, using the same

method used for cleaning the tank. Contaminated water generated from interior cleaning operations (of both piping and tank) shall not exceed the following quantities for each UST cleaned:

UST VOLUME (GALLONS)	PERCENT OF UST VOLUME
1,000 or less	5
10,000 or less	5 or 100 gal., whichever is less
20,000 or less	1 or 150 gal., whichever is less
greater than 20,000	1 or 250 gal., whichever is less

All contaminated water resulting from cleaning operations shall be handled in accordance with paragraph Contaminated Water Disposal. Cleaning shall be accomplished eliminating, to the greatest extent possible, the need for personnel to enter the tank. Cleaning shall be done using specially designed tank cleaning equipment which allows the tank to be cleaned prior to cutting into sections without requiring personnel to enter the tank or, if less specialized equipment is used, the tank shall be partially dissected to overcome confined space entry hazards.

### 3.10 SOIL EXAMINATION, TESTING, AND ANALYSIS

#### 3.10.1 Tank Excavation Sampling Procedures

After soil known to be contaminated has been removed or after soil excavation is complete, the excavation shall be sampled with procedures, number, location, and methodology in accordance with state regulations. Samples shall be obtained from the pits using a backhoe with a Shelby tube attached to the bucket. Sample preservation and analytical procedures shall conform to the Sampling and Analysis Plan.

#### 3.10.2 Stockpiled Material Sampling

Sampling locations, number and specific procedures shall be as required by the State of Virginia and the disposal facility.

#### 3.10.3 Analysis

Soil samples from the excavation and stockpiled material shall be tested in accordance with the approved Sampling and Analysis Plan, for the following parameters: total petroleum hydrocarbon (TPH), benzene, ethylbenzene, toluene, xylene (BETX) the following constituents: Diesel Range Organics (DRO) and Gasoline Range Organics (GRO). Copies of all test results shall be provided to the Contracting Officer.

### 3.11 BACKFILLING

The tank area and any other excavations shall be backfilled only after the soil test results have been approved. Contaminated soil removal shall be complete after the bottom of the tank excavation is determined to have soil contamination levels below the state standards of 100 ppm TPH. The excavation shall be dewatered if necessary. Stockpiled material subjected to chemical confirmation testing shall be used as backfill if it is found to conform to the requirements of clean fill per appropriate state regulations. Backfill consisting of clean fill shall be placed in layers with a maximum loose thickness of 8 inches, and compacted to 90 percent maximum density for cohesive soils and 95 percent maximum density for cohesionless soils. Density tests shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor.

Test results shall be attached to contractor's Quality Control Report. A minimum of 1 density test shall be performed on every third lift. Laboratory tests for moisture density relations shall be determined in accordance with ASTM D 1557, Method B, C, or D, or ASTM D 3017. A mechanical tamper may be used provided that the results are correlated with those obtained by the hand tamper. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2922, or ASTM D 2167.

### 3.12 DISPOSAL REQUIREMENTS

#### 3.12.1 Treatment, Disposal, and Recycling

Disposal of hazardous wastes shall be in accordance with all local, State, and Federal solid and hazardous waste laws and regulations; the RCRA; and conditions specified herein. This work shall include all necessary personnel, labor, transportation, packaging, detailed analyses (if required for disposal, manifesting or completing waste profile sheets), equipment, and reports. Product and pumpable liquids removed from the tank shall be recycled to the greatest extent practicable. The tanks removed shall be disposed of at one of the state approved facilities. Each tank disposed of in this manner shall be manifested as required by the State of Virginia to document delivery and acceptance at the disposal facility.

#### 3.12.2 Tank and Ancillary Equipment Disposal

After the tank, piping, and ancillary equipment have been removed from the excavation and the tank cleaned, the tank shall be cut into sections with no dimension greater than 5 feet. Tank and piping sections shall be disposed of in a State approved off-site disposal facility or in a salvage yard. The tank shall be cut into sections prior to being taken off Government property. The Contractor shall not sell the tank intact. Ancillary equipment shall be disposed of at an approved off-site disposal facility. Piping shall be disconnected from the tank and removed unless otherwise indicated.

#### 3.12.3 Transportation of Wastes

Transportation shall be provided in accordance with Department of Transportation (DOT) Hazardous Material Regulations and State and local requirements, including obtaining all necessary permits, licenses, and approvals. Evidence that a State licensed petroleum contaminated waste transporter is being used shall be included in the SUBMITTALS.

#### 3.12.4 Salvage Rights

The Contractor shall retain the rights to salvage value of recycled or reclaimed product and metal not turned in to the DRMO or otherwise identified, so long as the requirements of 40 CFR 266 and 40 CFR 279, or the applicable State requirements are met. At the end of the contract, the Contractor shall provide documentation on the disposition of salvaged materials.

#### 3.12.5 Records

Records shall be maintained of all waste determinations, including appropriate results of analyses performed, substances and sample location, the time of collection, and other pertinent data as required by 40 CFR 280, Section 74 and 40 CFR 262 Subpart D. Transportation, treatment, disposal methods and dates, the quantities of waste, the names and addresses of each

transporter and the disposal or reclamation facility, shall also be recorded and available for inspection, as well as copies of the following documents:

- a. Manifests.
- b. Waste analyses or waste profile sheets.
- c. Certifications of final treatment/disposal signed by the responsible disposal facility official.
- d. Land disposal notification records required under 40 CFR 268 for hazardous wastes.

Records shall be provided in accordance with Section 02120A TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS. Following contract close out, the records shall become the property of the Government.

#### 3.12.6 Hazardous/Special Waste Manifests

Manifesting shall conform to the requirements of the State of Virginia.

#### 3.12.7 Documentation of Treatment or Disposal

The wastes, other than recyclable or reclaimable product or metal, shall be taken to a treatment, storage, or disposal facility which has EPA or appropriate state permits and petroleum contaminated waste identification numbers and complies with the provisions of the disposal regulations. The original return copy of the hazardous waste manifest, signed by the owner or operator of a facility legally permitted to treat or dispose of those materials shall be furnished to the Contracting Officer not later than 5 working days following the delivery of those materials to the facility; and a copy shall be included in the Tank Closure Report. A statement of agreement from the proposed treatment, storage or disposal facility and certified transporters to accept hazardous or special wastes shall be furnished in the Work Plan to the Contracting Officer not less than 14 days before transporting any wastes. If the Contractor selects a different facility than is identified in the Work Plan, documentation shall be provided for approval to certify that the facility is authorized and meets the standards specified in 40 CFR 264.

#### 3.13 SPILLS

Immediate containment actions shall be taken as necessary to minimize effect of any spill or leak. Cleanup shall be in accordance with applicable Federal, State, local laws and regulations, and district policy at no additional cost to the Government. Refer to Section 02120A TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS for spill response and reporting requirements.

#### 3.14 TANK CLOSURE REPORT

Tank Closure Reports shall include the following information as a minimum:

- a. A cover letter signed by a responsible company official certifying that all services involved have been performed in accordance with the terms and conditions of this specification.
- b. A narrative report describing what was encountered at each site,

including:

- (1) condition of the UST.
  - (2) any visible evidence of leaks or stained soils.
  - (3) results of vapor monitoring readings.
  - (4) actions taken including quantities of materials treated or removed.
  - (5) reasons for selecting sample locations.
  - (6) sample locations.
  - (7) collection data such as time of collection and method of preservation.
  - (8) reasons for backfilling site.
  - (9) whether or not groundwater was encountered.
- c. Copies of all analyses performed for disposal.
- d. Copies of all waste analyses or waste profile sheets.
- e. Copies of all certifications of final disposal signed by the responsible disposal installation official.
- f. Information on who sampled, analyzed, transported, and accepted all wastes encountered, including copies of manifests, waste profile sheets, land disposal restriction, notification and certification forms, certificates of disposal, and other pertinent documentation.
- g. Copies of all analyses performed for confirmation that underlying soil is not contaminated, with copies of chain-of-custody for each sample. Analyses shall give the identification number of the sample used. Sample identification numbers shall correspond to those provided on the one-line drawings.
- h. Scaled one-line drawings showing tank locations, limits of excavation, limits of contamination, underground utilities within 50 feet, sample locations, and sample identification numbers.
- i. Progress Photographs. The Contractor shall take a minimum of 4 views of the site showing such things as the location of each tank, entrance/exit road, and any other notable site condition before work begins. After work has been started at the site, the Contractor shall photographically record activities at each work location daily. Photographs shall be 3 x 5 inches and shall include:
- (1) Soil removal, handling, and sampling.
  - (2) Unanticipated events such as discovery of additional contaminated areas.
  - (3) Soil stockpile area.

- (4) Tank.
- (5) Site or task-specific employee respiratory and personal protection.
- (6) Fill placement and grading.
- (7) Post-construction photographs. After completion of work at each site, the Contractor shall take a minimum of four (4) views of the site. Prints shall illustrate the condition and location of work and the state of progress. The photographs shall be mounted and enclosed back-to-back in a double face plastic sleeve punched to fit standard three ring binders. Each color print shall show an information box, 1-1/2 x 3-1/2 inches. The information box for the 3 x 5 inch photographs shall be scaled down accordingly, or taped to the bottom of the photo. The box shall be typewritten and arranged as follows:

Project No.	Contract No.
Location	
Contractor/Photographer	
Photograph No.	Date/Time:
Description	
Direction of View	

-- End of Section --

## SECTION 02780

CONCRETE BLOCK PAVEMENTS  
01/98

## PART 1 GENERAL

## 1.1 REFERENCES

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

## ACI INTERNATIONAL (ACI)

ACI 301 (1999) Standard Specifications for Structural Concrete

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 117 (1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing

ASTM C 131 (1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C 136 (1996a) Sieve Analysis of Fine and Coarse Aggregates

ASTM C 936 (1996) Solid Concrete Interlocking Paving Units

ASTM C 979 (1999) Pigments for Integrally Colored Concrete

ASTM D 4318 (1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM E 11 (1995) Wire-Cloth Sieves for Testing Purposes

## 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-04 Samples

Concrete Paving Block; G, A/E

A sample of five paving blocks prior to the start of the work.

Also, a representative sample of not less than 15 blocks as directed by the Contracting Officer, from each lot of 20,000 concrete paving blocks or fraction thereof.

### 1.3 MAINTENANCE

At the completion of work the Contractor shall provide 10 paving blocks matching those used in the project. These paving blocks shall be delivered stacked on pallets.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Bedding and Jointing Sand

Two separate sand gradations shall be used for the bedding layer and in the block joints. Both sand gradations shall consist of crushed sand, natural sand, or a combination of crushed and natural sand. Both sand gradations shall have a minimum L.A. Abrasion of 40 percent when tested in accordance with ASTM C 131. Both sand gradations shall be nonplastic when tested in accordance with ASTM D 4318 and shall be free of lumps, clay, vegetation, soft particles, sulphates, and other contaminants. The bedding and jointing sands shall conform to the following gradations, determined in accordance with ASTM C 136 and ASTM C 117, using ASTM E 11 sieve.

Sieve (ASTM E 11)	Percent Passing	
	Bedding Sand	Jointing Sand
3/8 in.	100	100
No. 4	80-100	100
No. 8	60-90	95-100
No. 16	25-70	70-100
No. 30	10-35	40-75
No. 50	5-20	10-40
No. 100	0-10	2-25
No. 200	0-5	0-10

#### 2.1.2 Concrete Paving Block

The concrete paving block shall conform to ASTM C 936, and shall be 3 thick, red in color, and rectangular in shape. Pigmentation shall conform to ASTM C 979.

#### 2.1.3 Edge Restraints

##### 2.1.3.1 Cast-in-Place Concrete

The edge restraint shall be portland cement concrete placed with the dimensions shown in the plans. Concrete shall conform to the requirements of ACI 301, except that it shall have a compressive strength of not less than 3,500 at 28 days and an entrained air content of not less than 6 percent.

## PART 3 EXECUTION

### 3.1 PREPARATION

#### 3.1.1 Edge Restraint Location

The edge restraint shall be placed as shown in the drawings and shall be installed prior to placement of the blocks.

#### 3.1.2 Sand Bedding Layer

The bedding sand shall be spread evenly over the area to be paved and shall be screeded to an uncompacted average thickness of 1-1/4 inch with a tolerance for grade and surface smoothness of plus or minus 1/4 inches. This bedding sand shall not be used to fill low areas that exceed the specified tolerance for the base. The sand shall be left uncompacted and shall not be disturbed by any pedestrian or vehicle construction traffic.

### 3.2 BLOCK PLACEMENT

The paving block shall be placed by hand or machine in the indicated pattern. Placement of paving block shall start from a corner or straight edge and proceed forward over the undisturbed sand bedding layer. The joints, excluding any chamfer between paving blocks, shall be not less than 1/16 inch or more than 1/4 inch in width. After seating, the block surface shall be flush or up to 1/4 inch above the edge restraint.

#### 3.2.1 Unfilled Gaps

Any gaps between paving blocks and any edge restraint, drainage structures, or other members that cannot be filled with a whole block shall be filled with a paving block cut to fit the gap, except that slivers will not be allowed and the minimum size of cut block shall be 2 inches. Cutting shall be done with a hydraulic splitter, a masonry saw, or other device that accurately leaves a clean, vertical face without spalling. Any remaining gap between the block and adjoining edge restraint or structure greater than 1/4 inch will not be accepted; adjacent blocks shall be cut or rearranged to prevent this.

#### 3.2.2 Seating Blocks

The blocks shall be seated in the bedding sand by compacting them with a minimum of three passes of a vibratory plate compactor.

#### 3.2.3 Jointing Sand

The jointing sand shall be swept into joints and vibrated with a vibratory plate or vibratory roller compactor. This process shall be continued until sweeping and vibrating have filled all joints with sand and further vibration cannot force additional sand into the joints. The coarser particles of the sand will not enter the joints and will remain on the surface. These particles and any excess sand shall be swept off the pavement.

#### 3.2.4 Timing of Operations

Seating of blocks and placement of jointing sand can be done concurrently with block placement. However, seating of blocks and placement of jointing sand shall not be done within 5 feet of any unfinished edge of the block pavement that is not supported by the edge restraint.

### 3.2.5 Final Rolling

The final finished paving block surface shall be rolled with four passes of a vibratory or pneumatic roller with a static weight of not less than 10,000 pounds.

### 3.2.6 Construction Traffic

Construction traffic shall not be allowed on the paving block surface until the jointing sand has been placed and vibrated into the joints and all debris and excess sand has been swept off.

### 3.3 CLEANUP

The Contractor shall sweep the entire pavement surface and remove all excess sand, blocks and debris from the project area.

### 3.4 SMOOTHNESS AND GRADE TOLERANCES

#### 3.4.1 Smoothness

No portion of the finished pavement surface shall deviate by more than 3/8 inch from a 10 foot long metal straightedge placed on the pavement surface.

#### 3.4.2 Block Height

The finished block surface shall be either flush or up to 1/4 inch higher than all edge restraints or drainage structures.

#### 3.4.3 Grade

The finished pavement shall be within 0.04 feet of planned grade shown on the plans.

#### 3.4.4 Remedial Action

Any area not meeting the smoothness, block height, or grade tolerance shall be taken up, adjustments made, and the blocks relaid.

-- End of Section --

## SECTION 02821A

FENCING  
02/02

## PART 1 GENERAL

## 1.1 REFERENCES

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

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 121	(1999) Zinc-Coated (Galvanized) Steel Barbed Wire
ASTM A 153/A 153M	(2001) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 585	(1997) Aluminum-Coated Steel Barbed Wire
ASTM A 780	(2000) Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings
ASTM A 824	(1995) Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link Fence
ASTM C 94/C 94M	(2000e2) Ready-Mixed Concrete
ASTM F 1043	(2000) Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework
ASTM F 1083	(1997) Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
ASTM F 626	(1996a) Fence Fittings
ASTM F 668	(1999a) Poly(Vinyl Chloride) (PVC)-Coated Steel Chain-Link Fence Fabric

## 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-07 Certificates

Chain Link Fence

Statement, signed by an official authorized to certify on behalf

of the manufacturer, attesting that the chain link fence and component materials meet the specified requirements.

### 1.3 APPROVAL OF POLYVINYL CHLORIDE-COATED FENCE MATERIALS

Polyvinyl chloride-coated fence materials shall be thoroughly inspected for cracking, peeling, and conformance with the specifications by the Contracting Officer's Representative prior to installation. Any fence materials rejected by the Contracting Officer's Representative shall be replaced by the contractor with approved materials at no additional cost to the Government.

## PART 2 PRODUCTS

### 2.1 FENCE FABRIC

Fence fabric shall conform to the following:

#### 2.1.1 Chain Link Fence Fabric

Class 2b polyvinyl chloride-coated steel fabric with 0.3 ounces of zinc coating per square foot in accordance with ASTM F 668. Fabric shall be fabricated of 9 gauge wire woven in 2 inch mesh. Polyvinyl chloride coating for fabric and all other fence components shall be manufacturer's standard brown in color. Fabric height shall be 6 feet. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.

### 2.2 POSTS

#### 2.2.1 Metal Posts for Chain Link Fence

ASTM F 1083, zinc-coated. Group IA, with external coating Type A steel pipe. Group IC steel pipe, zinc-coated with external coating Type A or Type B and Group II, roll-formed steel sections, shall meet the strength and coating requirements of ASTM F 1043. Group III, ASTM F 1043 steel H-section may be used for line posts in lieu of line post shapes specified for the other classes. Post shall be either Group IA steel pipe, Group IC, Group II, roll-formed steel sections, or Group III steel H-sections and shall be zinc coated (Type A) and polyvinyl chloride coated conforming to the requirements of ASTM F 1043. Line posts and terminal (corner, gate, and pull) posts selected shall be of the same designation throughout the fence.

### 2.3 BRACES AND RAILS

ASTM F 1083, zinc-coated, Group IA, steel pipe, size NPS 1-1/4. Group IC steel pipe, zinc-coated, shall meet the strength and coating requirements of ASTM F 1043. Braces and rails shall be Group IA, steel pipe, size NPS 1-1/4 or Group II, formed steel sections, size 1-21/32 inch and shall be zinc coated (Type A) and polyvinyl chloride-coated conforming to the requirements of ASTM F 1043. Group II, formed steel sections, size 1-21/32 inch, conforming to ASTM F 1043, may be used as braces and rails if Group II line posts are furnished.

### 2.4 WIRE

#### 2.4.1 Tension Wire

Tension wire shall be Type I or Type II, Class 2 coating, in accordance with ASTM A 824.

## 2.5 ACCESSORIES

ASTM F 626. Ferrous accessories shall be zinc or aluminum coated. Ferrous accessories shall also be polyvinyl chloride-coated, minimum thickness of 0.006 inch, maximum thickness of 0.015 inch. Color coating of fittings shall match the color coating of the fabric. Truss rods shall be furnished for each terminal post. Truss rods shall be provided with turnbuckles or other equivalent provisions for adjustment. Barbed wire shall be 2 strand, 12-1/2 gauge wire, zinc-coated, Class 3 in accordance with ASTM A 121 or aluminum coated Type I in accordance with ASTM A 585. Tie wire for attaching fabric to rails, braces, and posts shall be 9 gauge steel wire and match the coating of the fence fabric. Miscellaneous hardware coatings shall conform to ASTM A 153/A 153M unless modified. Threaded hardware shall be painted to match polyvinyl chloride coatings.

## 2.6 CONCRETE

ASTM C 94/C 94M, using 3/4 inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Grout shall consist of one part portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

## 2.7 SCREENING

Fencing screening shall be an open mesh, 6 foot high, polypropylene windscreen containing brown color pigmentation. Screening shall be as manufactured by Lee Tennis, Luck Stone Corp. or an approved equal.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Fence shall be installed to the lines and grades indicated. The area on either side of the fence line shall be cleared to the extent indicated. Line posts shall be spaced equidistant at intervals not exceeding 10 feet. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Fabric shall be continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Any damage to galvanized surfaces, including welding, shall be repaired with paint containing zinc dust in accordance with ASTM A 780.

### 3.2 EXCAVATION

Post holes shall be cleared of loose material. Waste material shall be spread where directed. The ground surface irregularities along the fence line shall be eliminated to the extent necessary to maintain a 2 inch clearance between the bottom of the fabric and finish grade.

### 3.3 POST INSTALLATION

#### 3.3.1 Posts for Chain Link Fence

Posts shall be set plumb and in alignment. Except where solid rock is encountered, posts shall be set in concrete to the depth indicated on the drawings. Where solid rock is encountered with no overburden, posts shall be set to a minimum depth of 18 inches in rock. Where solid rock is covered with an overburden of soil or loose rock, posts shall be set to the

minimum depth indicated on the drawing unless a penetration of 18 inches in solid rock is achieved before reaching the indicated depth, in which case depth of penetration shall terminate. All portions of posts set in rock shall be grouted. Portions of posts not set in rock shall be set in concrete from the rock to ground level. Posts set in concrete shall be set in holes not less than the diameter shown on the drawings. Diameters of holes in solid rock shall be at least 1 inch greater than the largest cross section of the post. Concrete and grout shall be thoroughly consolidated around each post, shall be free of voids and finished to form a dome. Concrete and grout shall be allowed to cure for 72 hours prior to attachment of any item to the posts. Group II line posts may be mechanically driven, for temporary fence construction only, if rock is not encountered. Driven posts shall be set to a minimum depth of 3 feet and shall be protected with drive caps when being set. For high security fences, fence post rigidity shall be tested by applying a 50 pound force on the post, perpendicular to the fabric, at 5 feet above ground; post movement measured at the point where the force is applied shall be less than or equal to 3/4 inch from the relaxed position; every tenth post shall be tested for rigidity; when a post fails this test, further tests on the next four posts on either side of the failed post shall be made; all failed posts shall be removed, replaced, and retested at the Contractor's expense.

### 3.4 RAILS

#### 3.4.1 Top Rail

Top rail shall be supported at each post to form a continuous brace between terminal posts. Where required, sections of top rail shall be joined using sleeves or couplings that will allow expansion or contraction of the rail. Top rail, if required for high security fence, shall be installed as indicated on the drawings.

### 3.5 BRACES AND TRUSS RODS

Braces and truss rods shall be installed as indicated and in conformance with the standard practice for the fence furnished. Horizontal (compression) braces and diagonal truss (tension) rods shall be installed on fences over 6 feet in height. A center brace or 2 diagonal truss rods shall be installed on 12 foot fences. Braces and truss rods shall extend from terminal posts to line posts. Diagonal braces shall form an angle of approximately 40 to 50 degrees with the horizontal. No bracing is required on fences 6 feet high or less if a top rail is installed.

### 3.6 TENSION WIRES

Tension wires shall be installed along the bottom of the fence line and attached to the terminal posts of each stretch of the fence. Bottom tension wire shall be installed within the bottom 6 inches of the installed fabric. Tension wire shall be pulled taut and shall be free of sag.

### 3.7 CHAIN LINK FABRIC

Chain link fabric shall be installed on the side of the post indicated. Fabric shall be attached to terminal posts with stretcher bars and tension bands. Bands shall be spaced at approximately 15 inch intervals. The fabric shall be installed and pulled taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric height. Fabric shall be fastened to line posts at approximately 15 inch intervals and fastened to all rails and tension wires

at approximately 24 inch intervals. Fabric shall be cut by untwisting and removing pickets. Splicing shall be accomplished by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be 2 plus or minus 1/2 inch above the ground. For high security fence, after the fabric installation is complete, the fabric shall be exercised by applying a 50 pound push-pull force at the center of the fabric between posts; the use of a 30 pound pull at the center of the panel shall cause fabric deflection of not more than 2-1/2 inches when pulling fabric from the post side of the fence; every second fence panel shall meet this requirement; all failed panels shall be resecured and retested at the Contractor's expense.

### 3.8 SCREENING

Screening shall be installed along the entire length of the Neally Avenue construction fence. Screening shall be maintained in good condition throughout the duration of the contract.

-- End of Section --

## SECTION 08110

## STEEL DOORS AND FRAMES

## 05/01

## 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 A250.6 (1997) Hardware on Standard Steel Doors  
(Reinforcement - Application)
- ANSI A250.8 (1998) SDI-100 Recommended Specifications  
for Standard Steel Doors and Frames

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM A 653/A 653M (2000) Steel Sheet, Zinc-Coated  
(Galvanized) or Zinc-Iron Alloy-Coated  
(Galvannealed) by the Hot-Dip Process
- ASTM A 924/A 924M (1999) General Requirements for Steel  
Sheet, Metallic-Coated by the Hot-Dip  
Process
- ASTM D 2863 (1997) Measuring the Minimum Oxygen  
Concentration to Support Candle-Like  
Combustion of Plastics (Oxygen Index)
- ASTM E 283 (1991) Rate of Air Leakage Through Exterior  
Windows, Curtain Walls, and Doors Under  
Specified Pressure Differences Across the  
Specimen

## DOOR AND HARDWARE INSTITUTE (DHI)

- DHI A115 (1991) Steel Door Preparation Standards  
(Consisting of A115.1 through A115.6 and  
A115.12 through A115.18)

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 80 (1999) Fire Doors and Fire Windows
- NFPA 252 (1999) Standard Methods of Fire Tests of  
Door Assemblies

## STEEL DOOR INSTITUTE (SDOI)

SDI 105

(1998) Recommended Erection Instructions  
for Steel Frames

UNDERWRITERS LABORATORIES (UL)

UL 10B

(1997) Fire Tests of Door Assemblies

## 1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

### SD-02 Shop Drawings

Doors

Frames

Accessories

Weatherstripping

Drawings using standard door type nomenclature in accordance with SDOI SDI 106 indicating the location of each door and frame, elevation of each model of door and frame, details of construction, method of assembling sections, location and extent of hardware reinforcement, hardware locations, type and location of anchors for frames, and thicknesses of metal. Drawings shall include catalog cuts or descriptive data for the doors, frames, method of glazing, and manufacturers printed instructions.

Schedule of doors

Schedule of frames

Submit door and frame locations.

### SD-03 Product Data

Doors

Frames

Accessories

Weatherstripping

Submit manufacturer's descriptive literature for doors, frames, and accessories. Include data and details on door construction, panel (internal) reinforcement, insulation, and door edge construction. When "custom hollow metal doors" are provided in lieu of "standard steel doors," provide additional details and data sufficient for comparison to ANSI A250.8 requirements.

Fire rated doors

A letter by a nationally recognized testing laboratory which identifies the product manufacturer, type, and model; certifying that the laboratory has tested a sample assembly in accordance with UL 10B and issued a current listing for same.

#### SD-04 Samples

Doors

Frames

Factory-applied prime paint coating

Where colors are not indicated, submit manufacturer's standard colors and patterns for selection.

### 1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new. Abraded, scarred, or rusty areas shall be cleaned and touched up with matching finishes.

### 1.4 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 5 year period shall be provided.

## PART 2 PRODUCTS

### 2.1 STEEL DOORS AND FRAMES

Doors and frames shall be factory fabricated in accordance with ANSI A250.8 and the additional requirements specified herein. Door Level shall be extra heavy duty (Level 3) except level 4 for exterior doors and frames unless otherwise indicated on the door and door frame schedules. Exterior doors and frames shall be designation A60 galvanized. Interior door frames shall be designation A60 galvanized. Doors and frames shall be prepared to receive hardware conforming to the templates and information provided under Section 08700 BUILDERS' HARDWARE. Doors and frames shall be reinforced, drilled, and tapped to receive mortised hinges, locks, latches, and flush bolts as required. Hinges shall be steel plate 3/16 inch thick by 1-1/2 inches wide by 6 inches longer than hinges, secured by not less than 6 spot welds and two billet welds. Strike plate cap shall be steel plate 3/16 inch thick by 1-1/2 inches wide by 3 inches long. Surface applied closer shall be 12 gauge steel sheet secured with not less than 6 spot welds. Doors and frames shall be reinforced for surface applied hardware. Frames shall be welded type for metal stud partitions and welded type for masonry walls and partitions. Door frames shall be furnished with a minimum of three jamb anchors (4 at doors greater than 7 foot - 6 inches high) and one floor anchor per jamb. Anchors for masonry walls shall be not less than 7 gauge zinc coated steel or 3/16 inch diameter wire at metal stud partitions. Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to closed steel studs with sheet metal screws, and to open steel studs by wiring or welding. For wall

conditions that do not allow the use of a floor anchor, an additional jamb anchor shall be provided. Rubber silencers shall be furnished for installation into factory predrilled holes in door frames; holes shall be protected with plaster guards or polystyrene glued to frame, adhesively applied silencers are not acceptable. Where frames are installed in masonry walls, plaster guards shall be provided. Provide 26 gauge plaster guards or dust cover boxes, welded to frame at back of all finish hardware cutouts where mortar or other materials might obstruct hardware installation. Reinforcing of door assemblies for closers and other required hardware shall be in accordance with ANSI A250.8 and the conditions of the fire door assembly listing when applicable. Exterior doors shall have top edges closed flush and sealed against water penetration. Doors shall be provided with spreader bars across bottom of frames, tack welded to jambs or mullions.

#### 2.1.1 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member. Where floor fill occurs, terminate bottom of frames at the indicated finished floor levels and support by adjustable extension clips resting on and anchored to the structural slabs.

#### 2.2 FIRE RATED DOORS

Fire rated door assemblies shall bear the listing identification label of a nationally recognized testing laboratory qualified to perform tests of fire door assemblies in accordance with UL 10B and NFPA 252 and having a listing for the tested assemblies. The fire resistance rating shall be as shown. Doors exceeding the sizes for which listing label service is offered shall be in accordance with UL 10B. Listing identification labels shall be constructed and permanently applied by a method which results in their destruction should they be removed.

#### 2.3 THERMAL INSULATED DOORS

The thermal insulated doors shall have a minimum insulated value of R10. The interior of thermal insulated doors shall be filled with rigid plastic foam permanently bonded to each face panel. Doors with cellular plastic cores shall have a minimum oxygen index rating of 22 percent when tested in accordance with ASTM D 2863.

#### 2.4 WEATHERSTRIPPING

Unless otherwise specified in Section 08700 BUILDERS' HARDWARE, weatherstripping shall be as follows: Weatherstripping for head and jamb shall be manufacturer's standard elastomeric type of synthetic rubber, vinyl, or neoprene and shall be installed at the factory or on the jobsite in accordance with the door frame manufacturer's recommendations. Weatherstripping for bottom of doors shall be as shown. Air leakage rate of weatherstripping shall not exceed 0.20 cfm per linear foot of crack when tested in accordance with ASTM E 283 at standard test conditions.

#### 2.5 SIDELIGHT PANELS

Panels for sidelight shall be constructed in accordance with ANSI A250.8. Panels shall be nonremovable from the outside of exterior doors or the unsecure side of interior doors.

#### 2.6 ACCESSORIES

### 2.6.1 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, as specified in Section 08710, "Door Hardware," provide overlapping steel astragals with the doors.

### 2.6.2 Moldings

Provide moldings around glass of interior doors. Moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings. Moldings shall be removable to secure side of frame.

## 2.7 STANDARD STEEL FRAMES

### 2.7.1 Stops and Beads

Form stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inches on centers. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

### 2.7.2 Cased Openings

Fabricate frames for cased openings of same material, gage, and assembly as specified for metal door frames, except omit door stops and preparation for hardware.

## 2.8 FIRE DOORS AND FRAMES

NFPA 80 and this specification. The requirements of NFPA 80 shall take precedence over details indicated or specified.

### 2.8.1 Labels

Fire doors and frames shall bear the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing shall be in accordance with NFPA 252 or UL 10B. Labels shall be metal with raised letters, and shall bear the name or file number of the door and frame manufacturer. Labels shall be permanently affixed at the factory to frames and to the hinge edge of the door. Door labels shall not be painted.

### 2.8.2 Oversized Doors

For fire doors and frames which exceed the size for which testing and labeling are available, furnish certificates stating that the doors and frames are identical in design, materials, and construction to a door which has been tested and meets the requirements for the class indicated.

### 2.8.3 Astragal on Fire Doors

On pairs of labeled fire doors, conform to NFPA 80 and UL requirements.

## 2.9 WEATHERSTRIPPING

As specified in Section 08710, "Door Hardware."

## 2.10 HARDWARE PREPARATION

Provide as specified and where not specified provide minimum hardware reinforcing gages as specified in ANSI A250.6. Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of ANSI A250.8 and ANSI A250.6.

For additional requirements refer to DHI A115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of ANSI A250.8, as applicable. Punch door frames, with the exception of frames that will have weatherstripping or soundproof gasketing, to receive a minimum of three rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

## 2.11 FINISHES

### 2.11.1 Hot-Dip Zinc-Coated (Galvannealed) and Factory-Primed Finish

Fabricate exterior and interior doors and frames from hot dipped zinc coated steel, alloyed type, that complies with ASTM A 924/A 924M and ASTM A 653/A 653M. The Coating weight shall meet or exceed the minimum requirements for coatings having 0.6 ounces per square foot, total both sides, i.e., A60. Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in ANSI A250.8. Provide for exterior and interior doors and frames.

## 2.12 FABRICATION AND WORKMANSHIP

Finished doors and frames shall be strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Molded members shall be clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints shall be well formed and in true alignment. Conceal fastenings where practicable. On wraparound frames for masonry partitions, provide a throat opening 1/8 inch larger than the actual masonry thickness. Design other frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive sealant.

### 2.12.1 Grouted Frames

For frames to be installed in masonry walls, fill with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

### 2.12.2 Foam Filled Frames

For frames associated with sound masking zones shown on Drawing E-707, all door frames opening through these zones shall be foam filled. See Specification Section 04200 MASONRY for material requirements of "Foam Type Insulation."

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Frames

Set frames in accordance with SDI 105. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts. Build in or secure wall anchors to adjoining construction. Where frames require ceiling struts or overhead bracing, anchor frames to the struts or bracing. Backfill frames with mortar. When an additive is provided in the mortar, coat inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed. Contractor shall coordinate the work with that of other trades and shall verify opening dimensions with contract and shop drawings.

#### 3.1.2 Doors

Hang doors in accordance with clearances specified in ANSI A250.8. After erection and glazing, clean and adjust hardware.

#### 3.1.3 Fire Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80.

### 3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of one coat cold galvanize paint and one coat of rust-inhibitive paint of the same type used for shop coat.

### 3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

## SECTION 10430A

## EXTERIOR SIGNAGE

06/01

## 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.

## NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 505

(1988) Metal Finishes Manual for  
Architectural and Metal Products

## 1.2 GENERAL

All exterior signage shall be provided by a single manufacturer. Exterior signage shall be of the design, detail, sizes, types, and message content shown on the drawings, shall conform to the requirements specified, and shall be provided at the locations indicated. Signs shall be complete with lettering, framing as detailed, and related components for a complete installation. Recyclable materials shall conform to EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

## 1.3 CHARACTER PROPORTIONS AND HEIGHTS

Letters and numbers on indicated signs for handicapped-accessible buildings shall have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10. Characters and numbers on indicated signs shall be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case letter "X". Lower case characters are permitted.

## 1.4 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

## Approved Detail Drawings; G

Drawings showing elevations of each type of dimensional building letters; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction. A schedule showing the location, each sign type, and message shall be included.

## SD-03 Product Data

#### Dimensional building letters

Manufacturer's descriptive data and catalog cuts.

#### Installation

Manufacturer's installation instructions and cleaning instructions.

#### SD-04 Samples

##### Dimensional building letters; G

One 12 inch length of framing for illuminated signs. One sample of letter. Samples may be installed in the work, provided each sample is identified and location recorded. Two samples of manufacturer's standard color chips for each material requiring color selection.

#### SD-10 Operation and Maintenance Data

##### Protection and Cleaning

Six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall include simplified diagrams for the equipment as installed.

### 1.5 QUALIFICATIONS

Signs, plaques, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 5 years prior to bid opening.

### 1.6 DELIVERY AND STORAGE

Materials shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

### 1.7 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

## PART 2 PRODUCTS

### 2.1 DIMENSIONAL BUILDING LETTERS

#### 2.1.1 Fabrication

Letters shall be fabricated from cast aluminum. Letters shall be cleaned by chemical etching or cleaned ultrasonically in a special degreasing bath. Letters shall be packaged for protection until installation.

#### 2.1.2 Typeface

Typeface shall be Berling Bold upper case.

#### 2.1.3 Size

Letter size shall be as indicated.

#### 2.1.4 Finish

Baked enamel or finish shall be provided.

#### 2.1.5 Mounting

Threaded studs of number and size as recommended by manufacturer, shall be used for concealed anchorage. Letters which project from the building line shall have stud spacer sleeves. Letters, studs, and sleeves shall be of the same material. Templates for mounting shall be supplied.

#### 2.1.6 Messages

Messages shall be as indicated.

### 2.2 ORGANIC COATING

Surfaces shall be cleaned, primed, and given a semi-gloss baked enamel finish in accordance with NAAMM AMP 505 with total dry film thickness not less than 1.2 mils.

### 2.3 COLOR, FINISH, AND CONTRAST

Color of products shall be as indicated.

### 2.4 For Bid Purposes

For bid purposes there shall be 23 letter characters, 12 inches in height. Text and location shall be as directed by Contracting Officer.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Dimensional letters shall be installed in accordance with approved manufacturer's instructions at locations shown on the approved detail drawings. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces shall not be installed until finishes on such surfaces have been completed.

#### 3.1.1 Anchorage

Anchorage and fastener materials shall be non-ferrous and in accordance with approved manufacturer's instructions for the indicated substrate. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry.

#### 3.1.2 Protection and Cleaning

The work shall be protected against damage during construction. Signs shall be cleaned, as required, at time of cover removal.

-- End of Section --

## SECTION 13720

ELECTRONIC SECURITY SYSTEM  
05/98

## PART 1 GENERAL

## 1.1 REFERENCES

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

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI X3.92 (1981; R 1993) Data Encryption Algorithm  
ANSI X3.154 (1988; R 1994) Office Machines and Supplies  
- Alphanumeric Machines-Keyboard Arrangement

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

47 CFR 15 Radio Frequency Devices  
47 CFR 68 Connection of Terminal Equipment to the  
Telephone Network

## ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA 170 (1957) Electrical Performance Standards -  
Monochrome Television Studio Facilities  
EIA ANSI/EIA/TIA-232-F (1997) Interface Between Data Terminal  
Equipment and Data Circuit-Terminating  
Equipment Employing Serial Binary Data  
Interchange  
EIA ANSI/EIA-310-D (1992) Cabinets, Racks, Panels, and  
Associated Equipment  
EIA ANSI/TIA/EIA-568-A (1995; Addendum 3 1998) Commercial Building  
Telecommunications Cabling Standard

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (1997) National Electrical Safety Code  
IEEE C62.41 (1991; R 1995) Surge Voltages in  
Low-Voltage AC Power Circuits  
IEEE Std 142 (1991) IEEE Recommended Practice for  
Grounding of Industrial and Commercial  
Power Systems

## INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 7810 (1995) Identification Cards - Physical

## Characteristics

ISO 7811-1	(1995) Identification Cards - Recording Technique - Part 1: Embossing
ISO 7811-2	(1995) Identification Cards - Recording Technique - Part 2: Magnetic Stripe
ISO 7811-3	(1995) Identification Cards - Recording Technique - Part 3: Location of Embossed Characters on ID-1 Cards
ISO 7811-4	(1995) Identification Cards - Recording Technique - Part 4: Location of Read-Only Magnetic Tracks - Tracks 1 and 2
ISO 7811-5	(1995) Identification Cards - Recording Technique - Part 5: Location of Read-Write Magnetic Track - Track 3

## INTERNATIONAL TELECOMMUNICATION UNION (ITU)

ITU V.34	(1994) Data Communication Over the Telephone Network A Modem Operating at Data Signaling Rates of up to 28,800 bits for use on the General Switched Telephone Network and on Leased Point-to-Point Two-Wire Telephone Type Circuits
ITU V.42	(1993) Data Communications Over the Telephone Network Error-Correcting Procedures for DCEs Using Asynchronous-to-Synchronous Conversion

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(1997) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 1	(1993) Industrial Control and Systems

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1999) National Electrical Code
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## UNDERWRITERS LABORATORIES (UL)

UL 294	(1999) Access Control System Units
UL 639	(1997; Rev thru Mar 1999) Intrusion Detection Units
UL 681	(1999) Installation and Classification of Burglar and Holdup Alarm Systems
UL 796	(1999) Printed-Wiring Boards
UL 1037	(1999) Antitheft Alarms and Devices

UL 1076

(1995; Rev thru Feb 1999) Proprietary  
Burglar Alarm Units and Systems

## 1.2 SYSTEM DESCRIPTION

THE CONTRACTOR SHALL PROVIDE ALL CONDUIT, WIRING, CONSOLE, SIGNAL AND DATA TRANSMISSION (DTS) AS INDICATED AND REQUIRED BY THE EQUIPMENT MANUFACTURER (VINDICATOR), TO MAKE READY THE STRUCTURED PATHWAY AND CABLING SYSTEM FOR THE ESS FOR THE GOVERNMENT TO INSTALL THEIR SECURITY COMPONENTS. THE INFORMATION CONTAINED HEREIN THIS SPECIFICATION AND AS INDICATED ON THE DRAWINGS, INDICATES THE CONTRACTORS REQUIREMENTS FOR THE PATHWAY AND CABLING SYSTEM FOR THE ESS AND THE COMPONENT AND PERFORMANCE REQUIREMENTS FOR THE GOVERNMENT. The Electronic Security System shall be comprised of all systems/subsystems, but not limited to, Intrusion Detection System/Subsystem and Entry Control System/Subsystem and all other required Systems/Subsystems to perform the functions described herein. All systems/subsystems shall interface as one Electronic Security System (ESS). The ESS shall be completely compatible with and transmit alarm signals to the base security system (Law Enforcement Desk), and manufactured by Vindicator. Transmission to the base security system shall include, but not be limited to, 16 different distinguishable transmission types (i.e. zones, devices, alarm, trouble signals, etc. Coordinate the exact type of signals required to transmit to the base security system, with the Contracting Officer. All computing devices, as defined in 47 CFR 15, shall be certified to comply with the requirements for Class A computing devices and labeled as set forth in 47 CFR 15. Electronic equipment shall comply with 47 CFR 15.

The following Vindicator equipment and components are required for this project. Quantities will be as indicated on the drawings and as required by the manufacturer Vindicator to provide a complete operable and functioning security system (intrusion detection and access control and interface with the multiple closed circuit television systems throughout the building).

- a. Photo ID Badging Station Complete, Vindicator Catalog Model WIN IVS 600-32488-02
- b. Security Archive Workstation Complete, Vindicator Catalog Model SAW
- c. LCD Based Graphic Display - 17 inch color, Vindicator Catalog Model SAW
- d. Premises Control Unit, Vindicator Catalog Model PCU
- e. UHS 6842 Network Communications Network, Vindicator Catalog Model PCU
- f. Dial Up Modem, Vindicator Catalog Model Modem
- g. Card Swipe with PIN Keypad, Vindicator Catalog Model Card Swipe with PIN Keypad
- h. Triple Reed High Security Balanced Magnaetic Switch, Vindicator Catalog Model BMS or Sentrol series 2700.
- i. Passive Infrared Volumetric Detector, Vindicator Catalog Model PIR
- j. Magnetic Lock, Vindicator Catalog Model ML
- j. Pre Encoded Magnetic Cards, Vindicator Catalog Model Mag Card

- k. Additional items as required by Vindicator for a complete operational system.

#### 1.2.1 Central Station (Security Control Console)

The central station shall be configured to provide operator interface, interaction, dynamic and real time monitoring, display, and control. The central station shall control system networks to interconnect all system components including subordinate or separate control stations, enrollment stations and field equipment. The system shall be able to manage up to 16,000 uniquely identifiable inputs and outputs.

#### 1.2.2 Systems Networks

System networks shall interconnect all components of the system. These networks shall include communications between a central station and any subordinate or separate station, enrollment stations, local annunciation stations, portal control stations or redundant central stations. The systems network shall provide totally automatic communication of status changes, commands, field initiated interrupts and any other communications required for proper system operation. System communication shall not require operator initiation or response. System communication shall return to normal after any partial or total network interruption such as power loss or transient upset. The system shall automatically annunciate communication failures to the operator with identification of the communication link that has experienced a partial or total failure. A communications controller may be used as an interface between the central station display systems and the field device network. The communications controller shall provide those functions needed to attain the specified network communications performance.

##### 1.2.2.1 Console Network

A console network, if required, shall provide communication between a central station and any subordinate or separate stations of the system. Where redundant central or parallel stations are required, the console network shall allow the configuration of stations as master and slave. The console network may be a part of the field device network or may be separate depending upon the manufacturer's system configuration.

##### 1.2.2.2 Field Device Network

The field device network shall provide communication between a central control station and field devices of the system. The field device network shall be configured as shown in the drawings. Field devices shall consist of alarm annunciation local processors and entry control local processors (also indicated as PCU and/or access manager controller) Each field device shall be interrogated during each interrogation cycle. The field device network shall provide line supervision that detects and annunciates communications interruptions or compromised communications between any field device and the central station.

#### 1.2.3 Field Equipment

Field equipment shall include local processors, sensors and controls. Local processors shall serve as an interface between the central station and sensors and controls. Data exchange between the central station and

the local processors shall include down-line transmission of commands, software and databases to local processors. The up line data exchange from the local processor to the central station shall include status data such as intrusion alarms, status reports and entry control records. Local processors are categorized as alarm annunciation or entry control.

#### 1.2.4 CCTV System Interface

An interface shall be provided for connection of the central station to the CCTV system as specified in Section 16751 CLOSED CIRCUIT TELEVISION SYSTEMS and as shown. This shall not be accomplished by using an electro-mechanical relay assembly.

#### 1.2.5 Overall System Reliability Requirements

The system, including all components and appurtenances, shall be configured and installed to yield a mean time between failure (MTBF) of at least 10,000 hours.

#### 1.2.6 Error Detection and Retransmission

A cyclic code error detection method shall be used between local processors and the central station, which shall detect single and double bit errors, burst errors of 8 bits or less, and at least 99 percent of all other multibit and burst error conditions. Interactive or product error detection codes alone will not be acceptable. A message shall be in error if 1 bit is received incorrectly. The system shall retransmit messages with detected errors. A 2-digit decimal number shall be operator assignable to each communication link representing the number of retransmission attempts. When the number of consecutive retransmission attempts equals the assigned quantity, the central station shall print a communication failure alarm message. The system shall monitor the frequency of data transmission failure for display and logging.

#### 1.2.7 System Definitions

##### 1.2.7.1 Intrusion Alarm

An alarm resulting from the detection of a specified target, caused by an attempt to intrude into the protected area, or when entry into an entry controlled area is attempted without successfully using entry control procedures.

##### 1.2.7.2 Nuisance Alarm

An alarm resulting from the detection of an appropriate alarm stimulus, but which does not represent an attempt to intrude into the protected area.

##### 1.2.7.3 Environmental Alarm

An alarm during environmental conditions which exceed those specified.

##### 1.2.7.4 False Alarm

An alarm when there is no alarm stimulus.

##### 1.2.7.5 Duress Alarm

An alarm condition which results from a set of pre-established conditions

such as entering a special code into a keypad or by activating a switch. This alarm category shall take precedence over other alarm categories.

#### 1.2.7.6 Guard Tour Alarm

An alarm resulting from a guard being either early or late at a specified check-in location.

#### 1.2.7.7 Fail-Safe Alarm

An alarm resulting from detection of diminished functional capabilities.

#### 1.2.7.8 Power Loss Alarm

An alarm resulting from a loss of primary power.

#### 1.2.7.9 Entry Control Alarm

An alarm resulting from improper use of entry control procedures or equipment.

#### 1.2.7.10 Identifier

A card credential, keypad personal identification number or code, biometric characteristic or any other unique identification entered as data into the entry control database for the purpose of identifying an individual. Identifiers shall be used by the electronic security system for the purpose of validating passage requests for areas equipped with entry control equipment.

#### 1.2.7.11 Entry Control Devices

Any equipment which gives a user the means to input identifier data into the entry control system for verification.

#### 1.2.7.12 Facility Interface Device

A facility interface device shall be any type of mechanism which is controlled in response to passage requests and allows passage through a portal.

#### 1.2.8 Probability of Detection

Each zone shall have a continuous probability of detection greater than 90 percent and shall be demonstrated with a confidence level of 95 percent. This probability of detection is defined as 49 successful detections out of 50 tests or 96 successful detections out of 100 tests.

#### 1.2.9 Standard Intruder

The system shall be able to detect an intruder that weighs 100 pounds or less and is 5 feet tall or less. The intruder shall be dressed in a long-sleeved shirt, slacks and shoes unless environmental conditions at the site require protective clothing.

#### 1.2.9.1 Standard Intruder Movement

Standard intruder movement is defined as any movement such as walking, running, crawling, rolling, or jumping through a protected zone in the most

advantageous manner for the intruder.

#### 1.2.10 False Alarm Rate

##### 1.2.10.1 Interior

A false alarm rate of no more than 1 false alarm per sensor per 30 days at the specified probability of detection shall be provided.

##### 1.2.10.2 Exterior

A false alarm rate of no more than 1 false alarm per sensor per 5 days at the specified probability of detection shall be provided.

#### 1.2.11 Error and Throughput Rates

Error and throughput rates shall be single portal performance rates obtained when processing individuals 1 at a time.

##### 1.2.11.1 Type I Error Rate

Type I error rate is defined as an error where the system denies entry to an authorized, enrolled individual. The rate shall be less than 1 percent.

##### 1.2.11.2 Type II Error Rate

Type II error rate is defined as an error where the system grants entry to an unauthorized individual. The entry control Type II error rate shall be less than 0.001 percent.

#### 1.2.12 System Throughput

At the specified error rates, the system throughput rate through a single portal shall be as shown.

#### 1.2.13 Passage

Passage is defined as ingress and/or egress past an entry control device, or through a portal. Entry control procedures and equipment shall be implemented for passage through each portal as shown.

#### 1.2.14 Detection Resolution

The system shall have detection resolution sufficient to locate intrusions at each device and zone; and tampering at individual devices.

#### 1.2.15 Electrical Requirements

Electrically powered ESS equipment shall operate on 120 volt 60 Hz ac sources as shown. Equipment shall be able to tolerate variations in the voltage source of plus or minus 10 percent, and variations in the line frequency of plus or minus 2 percent with no degradation of performance.

#### 1.2.16 Power Line Surge Protection

Equipment connected to alternating current circuits shall be protected from power line surges. Equipment protection shall withstand surge test waveforms described in IEEE C62.41. Fuses shall not be used for surge protection.

### 1.2.17 Sensor and Device Wiring and Communication Circuit Surge Protection

Inputs shall be protected against surges induced on device wiring. Outputs shall be protected against surges induced on control and device wiring installed outdoors and as shown. Communications equipment shall be protected against surges induced on any communications circuit. Cables and conductors, except fiber optics, which serve as communications circuits from console to field equipment, and between field equipment, shall have surge protection circuits installed at each end. Protection shall be furnished at equipment, and additional triple electrode gas surge protectors rated for the application on each wireline circuit shall be installed within 3 feet of the building cable entrance. Fuses shall not be used for surge protection. The inputs and outputs shall be tested in both normal mode and common mode using the following two waveforms:

a. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 Volts and a peak current of 60 amperes.

b. An 8 microsecond rise time by 20 microsecond pulse width waveform with a peak voltage of 1000 Volts and a peak current of 500 amperes.

### 1.2.18 Power Line Conditioners

A power line conditioner shall be furnished for the console equipment and each local processor. The power line conditioners shall be of the ferro-resonant design, with no moving parts and no tap switching, while electrically isolating the secondary from the power line side. The power line conditioners shall be sized for 125 percent of the actual connected kVA load. Characteristics of the power line conditioners shall be as follows:

a. At 85 percent load, the output voltage shall not deviate by more than plus or minus 1 percent of nominal when the input voltage fluctuates between minus 20 percent to plus 10 percent of nominal.

b. During load changes of zero to full load, the output voltage shall not deviate by more than plus or minus 3 percent of nominal. Full correction of load switching disturbances shall be accomplished within 5 cycles, and 95 percent correction shall be accomplished within 2 cycles of the onset of the disturbance.

c. Total harmonic distortion shall not exceed 3-1/2 percent at full load.

### 1.2.19 System Reaction

#### 1.2.19.1 System Response

The field device network shall provide a system end-to-end response time of 1 second or less for every device connected to the system. Alarms shall be annunciated at the central station within 1 second of the alarm occurring at a local processor or device controlled by a local processor, and within 100 milliseconds if the alarm occurs at the central station. Alarm and status changes shall be displayed within 100 milliseconds after receipt of data by the central station. All graphics shall be displayed, including graphics generated map displays, on the console monitor within 5 seconds of alarm receipt at the security console. This response time shall be maintained during system heavy load.

#### 1.2.19.2 System Heavy Load Definition

For the purpose of system heavy load definition, the system shall consist of central station equipment, communication controller and required local processors. System heavy load conditions are defined as the occurrence of alarms at the rate of 10 alarms per second distributed evenly among all local processors in the system. The alarm printer shall continue to print out all occurrences, including time of occurrence, to the nearest second.

#### 1.2.20 Environmental Conditions

##### 1.2.20.1 Interior, Controlled Environment

System components, except the console equipment installed in interior locations, having controlled environments shall be rated for continuous operation under ambient environmental conditions of 36 to 122 degrees F dry bulb and 20 to 90 percent relative humidity, non-condensing.

##### 1.2.20.2 Interior, Uncontrolled Environment

System components installed in interior locations having uncontrolled environments shall be rated for continuous operation under ambient environmental conditions of minus 0 to 122 degrees F dry bulb and 10 to 95 percent relative humidity, non-condensing.

##### 1.2.20.3 Exterior Environment

System components that are installed in locations exposed to weather shall be rated for continuous operation under ambient environmental conditions of minus 30 to 122 degrees F dry bulb and 10 to 95 percent relative humidity, condensing. In addition, the system components shall be rated for continuous operation when exposed to performance conditions as specified in UL 294 and UL 639 for outdoor use equipment. Components shall be rated for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 2 feet thick, measured vertically.

##### 1.2.20.4 Console

Console equipment, unless designated otherwise, shall be rated for continuous operation under ambient environmental conditions of 60 to 85 degrees F and a relative humidity of 20 to 80 percent.

#### 1.2.21 System Capacity

The system shall monitor and control the number of inputs and outputs indicated and shall include an expansion capability of a minimum of 100 percent. The system shall discriminate to the individual sensors, switches, and terminal devices and report status at the central station. Backup power shall be provided to operate the complete system and all devices in detection mode for 24 hours and in alarm mode for 30 minutes.

### 1.3 DELIVERY OF TECHNICAL DATA AND COMPUTER SOFTWARE

All items of computer software, software license and technical data (including technical data which relates to computer software), which is of the ESS shall be delivered to the Contracting Officer and become the property of the Government, including all warrants and technical support.

All data delivered shall be identified by reference to the particular specification paragraph against which it is furnished.

### 1.3.1 Group I Technical Data Package

#### 1.3.1.1 System Drawings

The data package shall include the following:

- a. System block diagram.
- b. Console installation, block diagrams, and wiring diagrams.
- c. Local processor installation, typical block, and wiring diagrams.
- d. Local processor physical layout and schematics.
- e. Device wiring and installation drawings.
- f. Details of connections to power sources, including power supplies and grounding.
- g. Details of surge protection device installation.
- h. Sensor detection patterns.
- i. Details of interconnections with CCTV system.

#### 1.3.1.2 Manufacturer's Data

The data package shall include manufacturer's data for all materials and equipment, including terminal devices, local processors and central station equipment provided under this specification.

#### 1.3.1.3 System Description and Analyses

The data package shall include system descriptions, analyses, and calculations used in sizing equipment specified. Descriptions and calculations shall show how the equipment will operate as a system to meet the performance of this specification. The data package shall include the following:

- a. Central processor memory size.
- b. Communication speeds and protocol descriptions.
- c. Hard disk size and configuration.
- d. Floppy disk size and configuration.
- e. Alarm response time calculations.
- f. Command response time calculations.
- g. Start-up operations.
- h. Expansion capability and method of implementation.
- i. Sample copy of each report specified.

- j. Color photographs representative of typical graphics.
- k. System throughput calculation.

#### 1.3.1.4 Software Data

The software data package shall consist of descriptions of the operation and capability of system, and application software as specified.

#### 1.3.1.5 Overall System Reliability Calculations

The overall system reliability calculations data package shall include all manufacturer's reliability data and calculations required to show compliance with the specified reliability in accordance with paragraph, OVERALL SYSTEM RELIABILITY REQUIREMENTS.

#### 1.3.1.6 Certifications

Specified manufacturer's certifications shall be included with the data package certification.

#### 1.3.1.7 Key Control Plan

The Contractor shall provide a key control plan. The key control plan shall include the following:

- a. Procedures that will be used to log and positively control all keys during installation.
- b. A listing of all keys and where they are used.
- c. A listing of all persons allowed access to the keys.

#### 1.3.2 Group II Technical Data Package

The Contractor shall prepare a report of "Current Site Conditions" to the Government documenting changes to the site, or conditions that affect performance of the system to be installed. The Contractor shall provide specification sheets, or written functional requirements to support the findings, and a cost estimate to correct those site changes or conditions. The Contractor shall not correct any deficiency without written permission from the Government.

#### 1.3.3 Group III Technical Data Package

The Contractor shall prepare test procedures and reports for the pre-delivery test.

#### 1.3.4 Group IV Technical Data Package

The Contractor shall prepare test procedures and reports for the performance verification test and the endurance test. The Contractor shall deliver the performance verification test and endurance test procedures to the Government for approval.

##### 1.3.4.1 Operation and Maintenance Manuals

A draft copy of the operation and maintenance manuals, as specified for the

Group V technical data package, shall be delivered to the Government prior to beginning the performance verification test for use during site testing.

#### 1.3.4.2 Training Documentation

Lesson plans and training manuals for the training phases, including type of training to be provided, and a list of reference material, shall be delivered for approval.

#### 1.3.4.3 Data Entry

The Contractor shall enter all data needed to make the system operational. The Contractor shall deliver the data to the Government on data entry forms, utilizing data from the contract documents, Contractor's field surveys, and other pertinent information in the Contractor's possession required for complete installation of the data base. The Contractor shall identify and request from the Government, any additional data needed to provide a complete and operational ESS. The completed forms shall be delivered to the Government for review and approval at least 30 days prior to the Contractor's scheduled need date.

#### 1.3.4.4 Graphics

Where graphics are required and are to be delivered with the system, the Contractor shall create and install the graphics needed to make the system operational. The Contractor shall utilize data from the contract documents, Contractor's field surveys, and other pertinent information in the Contractor's possession to complete the graphics. The Contractor shall identify and request from the Government, any additional data needed to provide a complete graphics package. Graphics shall have sufficient level of detail for the system operator to assess the alarm. The Contractor shall supply hard copy, color examples at least 8 x 10 inches in size, of each type of graphic to be used for the completed system. The graphics examples shall be delivered to the Government for review and approval at least 30 days prior to the Contractor's scheduled need date.

#### 1.3.5 Group V Technical Data Package

Final copies of the manuals as specified, bound in hardback, loose-leaf binders, shall be delivered to the Government within 30 days after completing the endurance test. The draft copy used during site testing shall be updated with any changes required prior to final delivery of the manuals. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and nearest service representative for each item of equipment. The manuals shall have a table of contents and tab sheets. Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix. The final copies delivered after completion of the endurance test shall include modifications made during installation, checkout, and acceptance. The number of copies of each manual to be delivered shall be as specified on DD FORM 1423.

##### 1.3.5.1 Functional Design Manual

The functional design manual shall identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions. A description of hardware and software functions, interfaces, and requirements shall be included for all system operating

modes.

#### 1.3.5.2 Hardware Manual

A manual describing all equipment furnished including:

- a. General description and specifications.
- b. Installation and checkout procedures.
- c. Equipment electrical schematics and layout drawings.
- d. System schematics and layout drawings.
- e. Alignment and calibration procedures.
- f. Manufacturer's repair parts list indicating sources of supply.
- g. Interface definition.

#### 1.3.5.3 Software Manual

The software manual shall describe the functions of all software and shall include all other information necessary to enable proper loading, testing, and operation. The manual shall include:

- a. Definition of terms and functions.
- b. Use of system and applications software.
- c. Procedures for system initialization, start-up and shutdown.
- d. Alarm reports.
- e. Reports generation.
- f. Data base format and data entry requirements.
- g. Directory of all disk files.
- h. Description of all communication protocols, including data formats, command characters, and a sample of each type of data transfer.

#### 1.3.5.4 Operator's Manual

The operator's manual shall fully explain all procedures and instructions for the operation of the system, including:

- a. Computers and peripherals.
- b. System start-up and shutdown procedures.
- c. Use of system, and applications software.
- d. Recovery and restart procedures.
- e. Graphic alarm presentation.
- f. Use of report generator and generation of reports.

- g. Data entry.
- h. Operator commands.
- i. Alarm and system messages and printing formats.
- j. System entry requirements.

#### 1.3.5.5 Maintenance Manual

The maintenance manual shall include descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

#### 1.3.5.6 Final System Drawings

The Contractor shall maintain a separate set of drawings, elementary diagrams and wiring diagrams of the system to be used for final system drawings. This set shall be accurately kept up-to-date by the Contractor with all changes and additions to the ESS and shall be delivered to the Government with the final endurance test report. In addition to being complete and accurate, this set of drawings shall be kept neat and shall not be used for installation purposes. Final drawings submitted with the endurance test report shall be finished drawings on vellum and CD-ROM.

### 1.4 TESTING

#### 1.4.1 General

The Contractor shall perform pre-delivery testing, site testing, and adjustment of the completed ESS. The Contractor shall provide personnel, equipment, instrumentation, and supplies necessary to perform testing. Written notification of planned testing shall be given to the Government at least 14 days prior to the test; notice shall not be given until after the Contractor has received written approval of the specific test procedures.

#### 1.4.2 Test Procedures and Reports

Test procedures shall explain in detail, step-by-step actions and expected results, demonstrating compliance with the requirements specified. Test reports shall be used to document results of the tests. Reports shall be delivered to the Government within 7 days after completion of each test.

### 1.5 TRAINING

#### 1.5.1 General

The Contractor shall conduct training courses for designated personnel in the maintenance and operation of the system as specified. The training shall be oriented to the specific system being installed. Training manuals shall be delivered for each trainee with 2 additional copies delivered for archiving at the project site. The manuals shall include an agenda, defined objectives for each lesson, and a detailed description of the subject matter for each lesson. The Contractor shall furnish audio-visual equipment and other training materials and supplies. Where the Contractor presents portions of the course by audio-visual material, copies of the audio-visual material shall be delivered to the Government either as a part of the printed training manuals or on the same media as that used during

the training sessions. A training day is defined as 8 hours of classroom instruction, including 2 15-minute breaks and excluding lunchtime, Monday through Friday, during the daytime shift in effect at the training facility. For guidance in planning the required instruction, the Contractor shall assume that attendees will have a high school education or equivalent, and are familiar with ESS. Approval of the planned training schedule shall be obtained from the Government at least 30 days prior to the training.

#### 1.5.2 Operator's Training I

The first course shall be taught at the project site for a period of 5 consecutive training days at least 3 months prior to the scheduled performance verification test. A maximum of 12 personnel shall attend this course. Upon completion of this course, each student, using appropriate documentation, shall be able to perform elementary operations with guidance and describe the general hardware architecture and functionality of the system. This course shall include:

- a. General System hardware architecture.
- b. Functional operation of the system.
- c. Operator commands.
- d. Data base entry.
- e. Reports generation.
- f. Alarm reporting.
- g. Diagnostics.

#### 1.5.3 Operator's Training II

The second course shall be taught at the project site for a period of 5 consecutive training days during or after the Contractor's field testing, but before commencing the performance verification test. A maximum of 12 personnel shall attend the course. No part of the training given during this course will be counted toward completion of the performance verification test. The course shall include instruction on the specific hardware configuration of the installed system and specific instructions for operating the installed system. Upon completion of this course, each student shall be able to start the system, operate the system, recover the system after a failure, and describe the specific hardware architecture and operation of the system.

#### 1.5.4 Operator's Training III

The third course shall be taught while the endurance test is in progress for a total of 16 hours of instruction per student, in time blocks of 4 hours. A maximum of 12 personnel shall attend the course. The schedule of instruction shall allow for each student to receive individual instruction for a 4-hour period in the morning (or afternoon) of the same weekday. The Contractor shall schedule his activities during this period so that the specified amount of time will be available during the endurance test for instructing the students. The course shall consist of hands-on training under the constant monitoring of the instructor. The instructor shall be responsible for determining the appropriate password to be issued to the

student commensurate with each student's acquired skills at the beginning of each of these individual training sessions. Upon completion of this course, the students shall be fully proficient in the operation of the system.

#### 1.5.5 System Manager Training

4 system managers shall be trained for at least 3 consecutive days. The system manager training shall consist of the operator's training and the following:

- a. Enrollment/disenrollment.
- b. Assignments of identifier data.
- c. Assign operator password/levels.
- d. Change database configuration.
- e. Modify graphics.
- f. Print special or custom reports.
- g. System backup.
- h. Any other functions necessary to manage the system.

#### 1.5.6 Maintenance Personnel Training

The system maintenance course shall be taught at the project site after completion of the endurance test for a period of 5 training days. A maximum of 5 personnel, designated by the Government, will attend the course. The training shall include:

- a. Physical layout of each piece of hardware.
- b. Troubleshooting and diagnostics procedures.
- c. Repair instructions.
- d. Preventive maintenance procedures and schedules.
- e. Calibration procedures. Upon completion of this course, the students shall be fully proficient in the maintenance of the system.

### 1.6 LINE SUPERVISION

#### 1.6.1 Signal and Data Transmission System (DTS) Line Supervision

All signal and DTS lines shall be supervised by the system. The system shall supervise the signal lines by monitoring the circuit for changes or disturbances in the signal, and for conditions as described in UL 1076 for line security equipment. The system shall initiate an alarm in response to a current change of 5 percent or greater. The system shall also initiate an alarm in response to opening, closing, shorting, or grounding of the signal and DTS lines.

#### 1.6.2 Data Encryption

The system shall incorporate data encryption equipment on data transmission circuits as shown. The algorithm used for encryption shall be the Data Encryption Standard (DES) algorithm described in ANSI X3.92.

#### 1.7 DATA TRANSMISSION SYSTEM

The Contractor shall provide a complete DTS as required and recommended by the manufacturer. Provide the DTS in metal conduit as specified in Section 16415.

#### 1.8 MAINTENANCE AND SERVICE

##### 1.8.1 Warranty Period

The Contractor shall provide services required and equipment necessary to maintain the entire system in an operational state as specified, for a period of 1 year after formal written acceptance of the system, and shall provide necessary material required for performing scheduled adjustments or other nonscheduled work.

##### 1.8.2 Description of Work

The adjustment and repair of the system includes all computer equipment, software updates, communications transmission equipment and DTS, local processors, sensors and entry control, facility interface, and support equipment. Responsibility shall be limited to Contractor installed equipment. The manufacturer's required adjustments and other work as necessary shall be provided.

##### 1.8.3 Personnel

Service personnel shall be certified in the maintenance and repair of similar types of equipment and qualified to accomplish work promptly and satisfactorily. The Government shall be advised in writing of the name of the designated service representative, and of any change in personnel.

##### 1.8.4 Schedule of Work

The Contractor shall perform 2 minor inspections at 6 month intervals (or more often if required by the manufacturer), and 2 major inspections offset equally between the minor inspections to effect quarterly inspection of alternating magnitude.

###### 1.8.4.1 Minor Inspections

Minor inspections shall include visual checks and operational tests of console equipment, peripheral equipment, local processors, sensors, and electrical and mechanical controls. Minor inspections shall also include mechanical adjustments, new ribbons, and other necessary adjustments on printers.

###### 1.8.4.2 Major Inspections

Major inspections shall include work described under paragraph Minor Inspections and the following work:

- a. Clean all system equipment and local processors, including interior and exterior surfaces.

- b. Perform diagnostics on all equipment.
- c. Check, walk test, and calibrate each sensor.
- d. Run all system software diagnostics and correct all diagnosed problems.
- e. Resolve any previous outstanding problems.
- f. Purge and compress data bases.

#### 1.8.4.3 Scheduled Work

Scheduled work shall be performed during regular working hours, Monday through Friday, excluding federal holidays.

#### 1.8.5 Emergency Service

The Government will initiate service calls when the system is not functioning properly. Qualified personnel shall be available to provide service to the complete system. The Government shall be furnished with a telephone number where the service supervisor can be reached at all times. Service personnel shall be at site within 2 hours after receiving a request for service. The system shall be restored to proper operating condition within 8 hours after service personnel arrive onsite.

#### 1.8.6 Operation

Performance of scheduled adjustments and repair shall verify operation of the system as demonstrated by the applicable tests of the performance verification test.

#### 1.8.7 Records and Logs

The Contractor shall keep records and logs of each task, and shall organize cumulative records for each component, and for the complete system chronologically. A continuous log shall be maintained for all devices. The log shall contain all initial settings. Complete logs shall be kept and shall be available for inspection on site, demonstrating that planned and systematic adjustments and repairs have been accomplished for the system.

#### 1.8.8 Work Requests

The Contractor shall separately record each service call request, as received. The form shall include the serial number identifying the component involved, its location, date and time the call was received, specific nature of trouble, names of service personnel assigned to the task, instructions describing what has to be done, the amount and nature of the material to be used, the time and date work started, and the time and date of completion. The Contractor shall deliver a record of the work performed within 5 days after work is accomplished.

#### 1.8.9 System Modifications

The Contractor shall make any recommendations for system modification in writing to the Government. System modifications shall not be made without prior approval of the Government. Any modifications made to the system shall be incorporated into the operation and maintenance manuals, and other

documentation affected.

#### 1.8.10 Software

The Contractor shall provide a description of all software updates to the Government, who will then decide whether or not they are appropriate for implementation. After notification by the Government, the Contractor shall implement the designated software updates and verify operation in the system. These updates shall be accomplished in a timely manner, fully coordinated with system operators, and shall be incorporated into the operation and maintenance manuals, and software documentation. There shall be at least 1 scheduled update near the end of the first year's warranty period, at which time the Contractor shall install and validate the latest released version of the Contractor's software.

### PART 2 PRODUCTS

#### 2.1 MATERIALS REQUIREMENTS

##### 2.1.1 Materials and Equipment

Units of the same type of equipment shall be products of a single manufacturer. All material and equipment shall be new and currently in production. Each major component of equipment shall have the manufacturer's model and serial number in a conspicuous place. System equipment shall conform to UL 294 and UL 1076.

##### 2.1.2 Field Enclosures

###### 2.1.2.1 Interior Sensor

Sensors to be used in an interior environment shall be housed in an enclosure that provides protection against dust, falling dirt, and dripping noncorrosive liquids.

###### 2.1.2.2 Exterior Sensor

Sensors to be used in an exterior environment shall be housed in an enclosure that provides protection against windblown dust, rain and splashing water, and hose directed water. Sensors shall be undamaged by the formation of ice on the enclosure.

###### 2.1.2.3 Interior Electronics

System electronics to be used in an interior environment shall be housed in enclosures which meet the requirements of NEMA 250 Type 12.

###### 2.1.2.4 Exterior Electronics

System electronics to be used in an exterior environment shall be housed in enclosures which meet the requirements of NEMA 250 Type 4X.

##### 2.1.3 Nameplates

Laminated plastic nameplates shall be provided for local processors. Each nameplate shall identify the local processor and its location within the system. Laminated plastic shall be 1/8 inch thick, white with black center core. Nameplates shall be a minimum of 1 x 3 inches, with minimum 1/4 inch high engraved block lettering. Nameplates shall be attached to

the inside of the enclosure housing the local processor. Other major components of the system shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a corrosion resistant plate secured to the item of equipment. Nameplates will not be required for devices smaller than 1 x 3 inches.

#### 2.1.4 Tamper Provisions

##### 2.1.4.1 Tamper Switches

Enclosures, cabinets, housings, boxes, and fittings having hinged doors or removable covers and which contain circuits or connections of the system and its power supplies, shall be provided with cover operated, corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door or cover is moved. The enclosure and the tamper switch shall function together and shall not allow direct line of sight to any internal components before the switch activates. Tamper switches shall be inaccessible until the switch is activated; have mounting hardware concealed so that the location of the switch cannot be observed from the exterior of the enclosure; be connected to circuits which are under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating; shall be spring-loaded and held in the closed position by the door or cover; and shall be wired so that they break the circuit when the door or cover is disturbed.

a. Nonsensor Enclosures: Tamper switches on nonsensor enclosures which must be opened to make routine maintenance adjustments to the system and to service the power supplies shall be push/pull-set, automatic reset type.

b. Sensor Enclosures: Tamper switches on sensor enclosures which must be opened to make routine maintenance adjustments to the sensor shall be provided.

##### 2.1.4.2 Enclosure Covers

Covers of pull and junction boxes provided to facilitate initial installation of the system need not be provided with tamper switches if they contain no splices or connections, but shall be protected by tack welding or brazing the covers in place or by tamper resistant security fasteners. Labels shall be affixed to such boxes indicating they contain no connections.

#### 2.1.5 Locks and Key-Lock Switches

##### 2.1.5.1 Locks

Locks shall be provided on system enclosures for maintenance purposes. Locks shall be UL listed, round-key type with 3 dual, 1 mushroom, 3 plain pin tumblers or conventional key type lock having a combination of 5 cylinder pin and 5-point 3 position side bar. Keys shall be stamped "U.S. GOVT. DO NOT DUP." The locks shall be arranged so that the key can only be withdrawn when in the locked position. Maintenance locks shall be keyed alike and only 2 keys shall be furnished for all of these locks. These keys shall be controlled in accordance with the key control plan as specified in paragraph Key Control Plan.

##### 2.1.5.2 Key-Lock-Operated Switches

Key-lock-operated switches required to be installed on system components shall be UL listed, round-key type, with 3 dual, 1 mushroom, and 3 plain pin tumblers or conventional key type lock having a combination of 5 cylinder pin and 5-point 3 position side bar. Keys shall be stamped "U.S. GOVT. DO NOT DUP." Key-lock-operated switches shall be 2 position, with the key removable in either position. All key-lock-operated switches shall be keyed differently and only 2 keys shall be furnished for each key-lock-operated-switch. These keys shall be controlled in accordance with the key control plan as specified in paragraph Key Control Plan.

#### 2.1.5.3 Construction Locks

If the Contractor requires locks during installation and construction, a set of temporary locks shall be used. The final set of locks installed and delivered to the Government shall not include any of the temporary locks.

#### 2.1.6 System Components

System components shall be designed for continuous operation. Electronic components shall be solid state type, mounted on printed circuit boards conforming to UL 796. Printed circuit board connectors shall be plug-in, quick-disconnect type. Power dissipating components shall incorporate safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current carrying capacity. Control relays and similar switching devices shall be solid state type or sealed electro-mechanical.

##### 2.1.6.1 Modularity

Equipment shall be designed for increase of system capability by installation of modular components. System components shall be designed to facilitate maintenance through replacement of modular subassemblies and parts.

##### 2.1.6.2 Maintainability

Components shall be designed to be maintained using commercially available tools and equipment. Components shall be arranged and assembled so they are accessible to maintenance personnel. There shall be no degradation in tamper protection, structural integrity, EMI/RFI attenuation, or line supervision after maintenance when it is performed in accordance with manufacturer's instructions. The system shall be configured and installed to yield a mean time to repair (MTTR) of not more than 8 hours. Repair time is the clock time from when maintenance personnel gain entrance to the system and begin work, until the system is fully functional.

##### 2.1.6.3 Interchangeability

The system shall be constructed with off-the-shelf components which are physically, electrically and functionally interchangeable with equivalent components as complete items. Replacement of equivalent components shall not require modification of either the new component or of other components with which the replacement items are used. Custom designed or one-of-a-kind items shall not be used. Interchangeable components or modules shall not require trial and error matching in order to meet integrated system requirements, system accuracy, or restore complete system functionality.

##### 2.1.6.4 Product Safety

System components shall conform to applicable rules and requirements of NFPA 70 and UL 294. System components shall be equipped with instruction plates including warnings and cautions describing physical safety, and special or important procedures to be followed in operating and servicing system equipment.

#### 2.1.7 Controls and Designations

Controls and designations shall be as specified in NEMA ICS 1.

#### 2.1.8 Special Test Equipment

The Contractor shall provide all special test equipment, special hardware, software, tools, and programming or initialization equipment needed to start or maintain any part of the system and its components. Special test equipment is defined as any test equipment not normally used in an electronics maintenance facility.

#### 2.1.9 Alarm Output

The alarm output of each sensor shall be a single pole double throw (SPDT) contact rated for a minimum of 0.25 A at 24 Volts dc.

### 2.2 CENTRAL STATION (Security Control Console) HARDWARE

The central station (Security Control Console) computer shall be a standard unmodified digital computer of modular design. The CPU word size shall be 64 bits or larger. The operating speed of the processor shall be at least 150 MHZ.

#### 2.2.1 Memory

The computer shall contain at least 256 megabytes of usable installed memory minimum, expandable to a minimum of 256 megabytes without additional chassis or power supplies.

#### 2.2.2 Power Supply

The power supply shall have a minimum capacity of 250 Watts.

#### 2.2.3 Real Time Clock (RTC)

A RTC shall be provided. Accuracy shall be within plus or minus 1 minute per month. The RTC shall maintain time in a 24-hour format including seconds, minutes, hours, date, and month and shall be resettable by software. The clock shall continue to function for a period of 1 year without power.

#### 2.2.4 Serial Ports

a. Two EIA ANSI/EIA/TIA-232-F serial ports shall be provided for general use.

b. Adjustable data transmission rates from 9600 to 57.6 Kbps shall be selectable under program control.

c. Sixteen additional EIA ANSI/EIA/TIA-232-F serial ports shall be provided as part of a communications coprocessor. The coprocessor word

size shall be 32 bytes or larger and the operating speed of the coprocessor shall be at least 66 MHZ. Communications with the field equipment shall be managed by this device. Multiplexed serial ports shall be expandable to 48 ports with 8 character transmit and receive buffers to each port. Total buffer size shall be a minimum of 1 megabyte.

#### 2.2.5 Parallel Port

An enhanced parallel port shall be provided.

#### 2.2.6 Color Monitor

The monitor shall be no less than 17 inches, with a minimum resolution of 1280 by 1024 pixels, noninterlaced, and a maximum dot pitch of 0.28 millimeters. The video card shall support at least 256 colors at a resolution of 1280 by 1024 at a minimum refresh rate of 70 Hz.

#### 2.2.7 Keyboard A101

A keyboard having a minimum 64 character, standard ASCII character, based on ANSI X3.154 shall be furnished.

#### 2.2.8 Enhancement Hardware

Enhancement hardware such as special function keyboards, special function keys, touch screen devices, or mouse shall be provided for frequently used operator commands such as: Help, Alarm Acknowledge, Place Zone In Access, Place Zone In Secure, System Test, Print Reports, Change Operator, Security Lighting Controls, and Display Graphics.

#### 2.2.9 Disk Storage

A hard disk with controller having a maximum average access time of 10 milliseconds shall be provided. The hard disk shall provide a minimum of 2.0 gigabytes of formatted storage. Additionally, a PCMCIA slot with a removable 500 megabyte hard drive shall be provided.

#### 2.2.10 Floppy Disk Drives

A high density floppy disk drive and controller in 3-1/2 inch size shall be provided.

#### 2.2.11 Magnetic Tape System

A 4 mm cartridge magnetic tape system shall be provided. The system capacity shall be 8.0 gigabytes minimum per tape. Each tape shall be computer grade, in a rigid cartridge with spring-loaded cover and write-protect.

#### 2.2.12 Modem

A modem shall be provided and operate at 56,000 bps, full duplex on circuits using asynchronous communications. Modem shall have error detection, auto answer/autodial, and call-in-progress detection. The modem shall meet the requirements of ITU V.34, ITU V.42 for error correction and ITU V.42 for data compression standards, and shall be suitable for operating on unconditioned voice grade telephone lines in conformance with 47 CFR 68.

### 2.2.13 Audible Alarm

The manufacturer's standard audible alarm shall be provided.

### 2.2.14 Mouse

A mouse with a minimum resolution of 400 dots per inch shall be provided.

### 2.2.15 CD-ROM Drive

A CD-ROM drive having a nominal storage capacity of 650 megabytes shall be provided. The CD-ROM drive shall have the following minimum characteristics:

- a. Data Transfer Rate: 1.2 Mbps.
- b. Average Access Time: 150 milliseconds.
- c. Cache memory: 256 Kbytes.
- d. Data throughput: 1 Mbyte/second, minimum.

### 2.2.16 Dot Matrix Alarm Printer

A dot matrix alarm printer shall be provided and interconnected to the central station equipment. The dot matrix alarm printer shall have a minimum 96 character, standard ASCII character set, based on ANSI X3.154 and with graphics capability. The printer shall be able to print in both red and black without ribbon change. The printers shall have adjustable sprockets for paper width up to 11 inches, print at least 80 columns per line and have a minimum speed of 200 characters per second. Character spacing shall be selectable at 10, 12 or 17 characters per inch. The printers shall utilize sprocket-fed fan fold paper. The units shall have programmable control of top-of-form. Twenty-five thousand sheets of printer paper and 12 ribbons shall be provided after successful completion of the endurance test.

### 2.2.17 Report Printer

A report printer shall be provided and interconnected to the central station equipment. The printer shall be a laser printer with printer resolution of at least 600 dots per inch. The printer shall have at least 2 megabytes of RAM. Printing speed shall be at least 8 pages per minute with a 100 sheet paper cassette and with automatic feed. Two thousand sheets of paper and 5 toner cartridges shall be furnished after successful completion of the endurance test.

### 2.2.18 Controllers

Controllers required for operation of specified peripherals, serial, and parallel ports shall be provided.

### 2.2.19 Central Station Equipment Enclosures

The Contractor shall provide color coordinated consoles and equipment cabinets. Equipment cabinets shall have front and back plexiglass doors, thermostatic controlled bottom-mounted fan, and metal fitted and louvered tops. One locking cabinet approximately 6 feet high, 3 feet wide, 18 to 36 inches deep with 3 adjustable shelves, and 4 storage racks for storage

of disks, tapes, printouts, printer paper, ribbons, manuals, and other documentation shall be provided.

#### 2.2.20 Uninterruptible Power Supply (UPS)

A self contained UPS, suitable for installation and operation at the central station, shall be provided. The UPS shall be sized to provide a minimum of 6 hours of operation of the central station equipment. Equipment connected to the UPS shall not be affected by a power outage of a duration less than the rated capacity of the UPS. UPS shall be complete with necessary power supplies, transformers, batteries, and accessories and shall include visual indication of normal power operation, UPS operation, abnormal operation and visual and audible indication of low battery power. The UPS shall be as specified in Section 16265, UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEM ABOVE 15 kVa CAPACITY. The UPS condition shall be monitored by the ESS and displayed at the Central Station.

#### 2.2.21 Fixed Map Display

A fixed map display shall be provided showing a layout of the protected facilities. Zones corresponding to those monitored by the system shall be highlighted on the display. Status of each zone shall be displayed using LED's as required within each designated zone. An LED test switch shall be provided on the map display.

#### 2.2.22 Enrollment Center Equipment

Enrollment stations shall be provided and located as shown to enroll personnel into, and disenroll personnel from the system database. The enrollment equipment shall only be accessible to authorized entry control enrollment personnel. The Contractor shall provide enough credential cards for 1500 personnel to be enrolled at the site plus an extra 50 percent for future use. The enrollment equipment shall include subsystem configuration controls and electronic diagnostic aids for subsystem setup and troubleshooting with the central station. A printer shall be provided for the enrollment station which meets the requirements of paragraph Report Printer.

#### 2.2.23 Enrollment Center Accessories

A steel desk-type console, a swivel chair on casters and equipment racks shall be provided. The console shall be as specified in EIA ANSI/EIA-310-D and as shown. Equipment racks shall be as specified in EIA ANSI/EIA-310-D and as shown. All equipment, with the exception of the printers, shall be rack mounted in the console and equipment racks or as shown. The console and equipment racks and cabinets shall be color coordinated. A locking cabinet approximately 6 feet high, 3 feet wide, and 2 feet deep with 3 adjustable shelves, and 2 storage racks for storage of disks, tapes, printouts, printer paper, ribbons, manuals, and other documentation shall be provided.

#### 2.2.24 Secondary Alarm Annunciation Site

Secondary alarm annunciation console shall be located at the buildings main security entry control point room. Hardware and software needed for the secondary alarm annunciation console shall be provided. The secondary alarm annunciation console shall display alarms or system status changes only.

### 2.3 CENTRAL STATION SOFTWARE

Software shall support all specified functions. The central station shall be online at all times and shall perform required functions as specified. Software shall be resident at the central station and/or the local processor as required to perform specified functions.

#### 2.3.1 System Software

System software shall perform the following functions:

- a. Support multiuser operation with multiple tasks for each user.
- b. Support operation and management of peripheral devices.
- c. Provide file management functions for disk I/O, including creation and deletion of files, copying files, a directory of all files including size and location of each sequential and random ordered record.
- d. Provide printer spooling.

#### 2.3.2 Real Time Clock Synchronization

The system shall synchronize each real time clock within 1 second and at least once per day automatically, without operator intervention and without requiring system shutdown.

#### 2.3.3 Database Definition Process

Software shall be provided to define and modify each point in the database using operator commands. The definition shall include all parameters and constraints associated with each sensor, commandable output, zone, facility interface device, terminal device, etc. Each database item shall be callable for display or printing, including EPROM, ROM and RAM resident data. The database shall be defined and entered into the ESS by the Contractor based upon input from the Government.

#### 2.3.4 Software Tamper

The ESS shall annunciate a tamper alarm when unauthorized changes to the system database files are attempted. Three consecutive unsuccessful attempts to log onto the system shall generate a software tamper alarm. A software tamper alarm shall also be generated when an operator or other individual makes 3 consecutive unsuccessful attempts to invoke central processor functions beyond their authorization level. The ESS shall maintain a transcript file of the last 5000 commands entered at each central station to serve as an audit trail. The system shall not allow write access to the system transcript files by any person, regardless of their authorization level. The system shall only allow acknowledgment of software tamper alarms and read access to the system transcript files by operators and managers with the highest password authorization level available in the system.

#### 2.3.5 Application Software

The application software shall provide the interface between the alarm annunciation and entry control local processors; monitor all sensors and DTS links; operate displays; report alarms; generate reports; and assist in training system operators.

#### 2.3.5.1 Operator Commands

The operator's commands shall provide the means for entry of monitoring and control commands, and for retrieval of system information. Processing of operator commands shall commence within 1 second of entry, with some form of acknowledgment provided at that time. The operator's commands shall perform tasks including:

- a. Request help with the system operation.
- b. Acknowledge alarms.
- c. Place zone in access.
- d. Place zone in secure.
- e. Test the system.
- f. Generate and format reports.
- g. Print reports.
- h. Change operator.
- j. Request any graphic displays implemented in the system. Graphic displays shall be completed within 20 seconds from time of operator command.
- k. Entry control functions.

#### 2.3.5.2 Command Input

Operator's commands shall be full English language words and acronyms selected to allow operators to use the system without extensive training or data processing backgrounds. The system shall prompt the operator in English word, phrase, or acronym. Commands shall be available in an abbreviated mode, in addition to the full English language (words and acronyms) commands, allowing an experienced operator to disregard portions, or all, of the prompt-response requirements.

#### 2.3.5.3 Command Input Errors

The system shall supervise operator inputs to ensure they are correct for proper execution. Operator input assistance shall be provided whenever a command cannot be executed because of operator input errors. The system shall explain to the operator, in English words and phrases, why the command cannot be executed. Error responses requiring an operator to look up a code in a manual or other document will not be accepted. Conditions for which operator error assist messages shall be generated include:

- a. The command used is incorrect or incomplete.
- b. The operator is restricted from using that command.
- c. The command addresses a point which is disabled or out of service.
- d. The command addresses a point which does not exist.

- e. The command would violate constraints.

#### 2.3.5.4 Enhancements

The system shall implement the following enhancements by use of special function keys, touch screen, or mouse, in addition to all other command inputs specified:

- a. Help: Used to produce a display for all commands available to the operator. The help command, followed by a specific command shall produce a short explanation of the purpose, use, and system reaction to that command.

- b. Acknowledge Alarms: Used to acknowledge that the alarm message has been observed by the operator.

- c. Place Zone in Access: Used to remotely disable intrusion alarm circuits emanating from a specific zone. The system shall be structured so that tamper circuits cannot be disabled by the console operator.

- d. Place Zone in Secure: Used to remotely activate intrusion alarm circuits emanating from a specific zone.

- e. System Test: Allows the operator to initiate a system wide operational test.

- f. Zone Test: Allows the operator to initiate an operational test for a specific zone.

- g. Print Reports: Allows the operator to initiate printing of reports.

- h. Change Operator: Used for changing operators.

- j. Display Graphics: Used to display any graphic displays implemented in the system.

#### 2.3.5.5 System Access Control

The system shall provide a means to define system operator capability and functions through multiple, password protected operator levels. At least 3 operator levels shall be provided. System operators and managers with appropriate password clearances shall be able to change operator levels for all operators. Three successive attempts by an operator to execute functions beyond their defined level during a 24-hour period shall initiate a software tamper alarm. A minimum of 32 passwords shall be usable with the system software. The system shall display the operator's name or initials in the console's first field. The system shall print the operator's name or initials, action, date, and time on the system printer at log-on and log-off. The password shall not be displayed or printed. Each password shall be definable and assignable for the following:

- a. Commands usable.
- b. Access to system software.
- c. Access to application software.
- d. Individual zones which are to be accessed.

- e. Access to database.

#### 2.3.5.6 Alarm Monitoring Software

This program shall monitor all sensors, local processors and DTS circuits and notify the operator of an alarm condition. Alarms shall be printed in red on the alarm printer and displayed on the console's text and graphics map monitors. Higher priority alarms shall be displayed first; and within alarm priorities, the oldest unacknowledged alarm shall be displayed first.

Operator acknowledgment of one alarm shall not be considered as acknowledgment of any other alarm nor shall it inhibit reporting of subsequent alarms. Alarm data to be displayed shall include type of alarm, location of alarm, and secondary alarm messages. Alarm data to be printed shall include: type of alarm, location of alarm, date and time (to nearest second) of occurrence, and operator response. A unique message field with a width of 60 characters shall be provided for each alarm. Assignment of messages to a zone or sensor shall be an operator editable function. Secondary messages shall be assignable by the operator for printing to provide further information and shall be editable by the operator. The system shall provide for 25 secondary messages with a field of 4 lines of 60 characters each. The most recent 1000 alarms shall be stored and shall be recallable by the operator using the report generator.

#### 2.3.5.7 Monitor Display Software

Monitor display software shall provide for text and graphics map displays that include zone status integrated into the display. Different colors shall be used for the various components and real time data. Colors shall be uniform on all displays. The following color coding shall be followed.

- a. FLASHING RED to alert an operator that a zone has gone into an alarm or that primary power has failed.
- b. RED to alert an operator that a zone is in alarm and that the alarm has been acknowledged.
- c. YELLOW to advise an operator that a zone is in access.
- d. GREEN to indicate that a zone is secure or that power is on.

#### 2.3.5.8 Map Displays/Graphics Linked to Alarms

The System shall relate map displays or other graphics to alarms. Whenever one of the predefined alarms is annunciated on a system control terminal, the map display or graphic related to the alarm shall be automatically displayed. The definition of which maps or graphics shall be displayed with each alarm shall be selectable by system operators through simple menu choices as part of the system initial configuration.

#### 2.3.5.9 User Defined Prompts/Messages Linked to Alarms

The System shall provide a means to relate operator defined prompts and other messages to predefined alarms. Whenever one of the predefined alarms is annunciated on a system control terminal, the prompts or messages related to the alarm shall be automatically displayed.

#### 2.3.5.10 System Test Software

This software shall enable the operator to initiate a test of the system.

This test can be of the entire system or of a particular portion of the system at the operator's option. The results of each test shall be stored for future display or print out in report form.

#### 2.3.5.11 Report Generator

Software shall be provided with commands to generate reports for displaying, printing, and storing on disk and tape. Reports shall be stored by type, date, and time and shall be printed on the report printer. Reports shall be spooled, allowing the printing of one report to be complete before the printing of another report commences. The dynamic operation of the system shall not be interrupted to generate a report. The report generation mode, either periodic, automatic or on request, shall be operator selectable. The report shall contain the time and date when the report was printed, and the name of operator generating the report. The exact format of each report type shall be operator configurable.

a. Periodic Automatic Report Modes: The system shall allow for specifying, modifying, or inhibiting the report to be generated, the time the initial report is to be generated, the time interval between reports, end of period, and the output peripheral.

b. Request Report Mode: The system shall allow the operator to request at any time an immediate printout of any report.

c. Alarm Report: The alarm report shall include all alarms recorded by the system over an operator selectable time. The report shall include such information as: the type of alarm (intrusion, tamper, etc.); the type of sensor; the location; the time; and the action taken.

d. System Test Report: This report documents the operational status of all system components following a system test.

e. Access/Secure Report: This report documents all zones placed in access, the time placed in access, and the time placed in secure mode.

f. Entry Control Reports: The system shall generate hard copy reports of identifier, terminal, and guard tour tracking reports, and versions with defined parameters of the manufacturer's standard management and activity reports.

#### 2.3.5.12 Simulation (Training) Software

This program shall enable operators to practice system operation including alarm acknowledgment, alarm assessment, response force deployment, and response force communications. The system shall continue normal operation during training exercises and shall terminate exercises when an alarm signal is received at the console.

#### 2.3.5.13 Entry Control Enrollment Software

The enrollment station shall provide database management functions for the system, and shall allow an operator to change and modify the data entered in the system as needed. The enrollment station shall not have any alarm response or acknowledgment functions. Multiple, password protected access levels shall be provided at the enrollment station. Database management and modification functions shall require a higher operator access level than personnel enrollment functions. The program shall provide a means for disabling the enrollment station when it is unattended to prevent

unauthorized use. The program shall provide a method to enter personnel identifying information into the entry control database files through enrollment stations. In the case of personnel identity verification subsystems, this data shall include biometric data. The program shall allow entry of this data into the system database files through the use of simple menu selections and data fields. The data field names shall be customized to suit user and site needs. All personnel identity verification subsystems selected for use with the system shall fully support the enrollment function and shall be compatible with the entry control database files.

## 2.4 FIELD PROCESSING HARDWARE

### 2.4.1 Alarm Annunciation Local Processor

The alarm annunciation local processor shall respond to interrogations from the field device network, recognize and store alarm status inputs until they are transmitted to the central station and change outputs based on commands received from the central station. The local processor shall also automatically restore communication within 10 seconds after an interruption with the field device network and provide dc line supervision on each of its alarm inputs.

a. Inputs. Local processor inputs shall monitor dry contacts for changes of state that reflect alarm conditions. The local processor shall have at least 8 alarm inputs which allow wiring as normally open or normally closed contacts for alarm conditions. It shall also provide line supervision for each input by monitoring each input for abnormal open, grounded, or shorted conditions using dc current change measurements. The local processor shall report line supervision alarms to the central station. Alarms shall be reported for any condition that remains off normal at an input for longer than 500 milliseconds. Each alarm condition shall be transmitted to the central computer during the next interrogation cycle.

b. Outputs. Local processor outputs shall reflect the state of commands issued by the central station. The outputs shall be a form C contact and shall include normally open and normally closed contacts. The local processor shall have at least 4 command outputs.

#### 2.4.1.1 Processor Power Supply

Local processor and sensors shall be powered from an uninterruptible power source. The uninterruptible power source shall provide 6 hours of battery back-up power in the event of primary power failure and shall automatically fully recharge the batteries within 12 hours after primary power is restored. There will be no equipment malfunctions or perturbations or loss of data during the switch from primary to battery power and vice versa. Batteries shall be sealed, non-outgassing type. The power supply shall be equipped with an indicator for ac input power and an indicator for dc output power. Loss of primary power shall be reported to the central station as an alarm.

#### 2.4.1.2 Auxiliary Equipment Power

A GFI service outlet shall be furnished inside the local processor's enclosure.

### 2.4.2 Entry Control Local Processor

The entry control local processor shall respond to interrogations from the field device network, recognize and store alarm status inputs until they are transmitted to the central station and change outputs based on commands received from the central station. The local processor shall also automatically restore communication within 10 seconds after an interruption with the field device network and provide dc line supervision on each of its alarm inputs. The entry control local processor shall provide local entry control functions including communicating with field devices such as card readers, keypads, biometric personal identity verification devices, door strikes, magnetic latches, gate and door operators and exit pushbuttons. The processor shall also accept data from entry control field devices as well as database downloads and updates from the central station that include enrollment and privilege information. The processor shall also send indications of success or failure of attempts to use entry control field devices and make comparisons of presented information with stored identification information. The processor shall grant or deny entry by sending control signals to portal control devices and mask intrusion alarm annunciation from sensors stimulated by authorized entries. The entry control local processor shall use inputs from entry control devices to change modes between access and secure. The local processor shall maintain a date-time and location stamped record of each transaction and transmit transaction records to the central station. The processor shall operate as a stand-alone portal controller using the downloaded data base during periods of communication loss between the local processor and the field device network. The processor shall store up to 1000 transactions during periods of communication loss between the local processor and the field device network for subsequent upload to the central station upon restoration of communication. The local processor shall provide power for field devices and portal control devices.

a. Inputs. Local processor inputs shall monitor dry contacts for changes of state that reflect alarm conditions. The local processor shall have at least 8 alarm inputs which allow wiring as normally open or normally closed contacts for alarm conditions. It shall also provide line supervision for each input by monitoring each input for abnormal open, grounded, or shorted conditions using dc current change measurements. The local processor shall report line supervision alarms to the central station. Alarms shall be reported for any condition that remains off normal at an input for longer than 500 milliseconds. Each alarm condition shall be transmitted to the central station during the next interrogation cycle. The entry control local processor shall include the necessary software drivers to communicate with entry control field devices. Information generated by the entry control field devices shall be accepted by the local processor and automatically processed to determine valid identification of the individual present at the portal. Upon authentication of the credentials or information presented, the local processor shall automatically check privileges of the identified individual, allowing only those actions granted as privileges. Privileges shall include, but not be limited to, time of day control, day of week control, group control, and visitor escort control. The local processor shall maintain a date-time and location stamped record of each transaction. A transaction is defined as any successful or unsuccessful attempt to gain access through a controlled portal by the presentation of credentials or other identifying information.

b. Outputs. Local processor outputs shall reflect the state of commands issued by the central station. The outputs shall be a form C contact and shall include normally open and normally closed contacts. The

local processor shall have at least 4 commandable outputs. The entry control local processor shall also provide control outputs to portal control devices.

c. Degraded Mode of Operation. The entry control local processor shall provide a degraded mode of operation for periods when communication between the local processor and the field device network is lost. While in this degraded mode, the local processor shall continue to control entry by accepting identifying information, making authentication decisions, checking privileges, and controlling portal control devices. Transactions shall be stored for subsequent transmission to the central station when communication is restored.

#### 2.4.2.1 Processor Power Supply

Local processor and sensors shall be powered from an uninterruptible power source. The uninterruptible power source shall provide 6 hours of battery back-up power in the event of primary power failure and shall automatically fully recharge the batteries within 12 hours after primary power is restored. There shall be no equipment malfunctions or perturbations or loss of data during the switch from primary to battery power and vice versa. Batteries shall be sealed, non-outgassing type. The power supply shall be equipped with an indicator for ac input power and an indicator for dc output power.

#### 2.4.2.2 Auxiliary Equipment Power

A GFI service outlet shall be furnished inside the local processor's enclosure.

### 2.5 FIELD PROCESSING SOFTWARE

All Field processing software described in this specification shall be furnished as part of the complete system.

#### 2.5.1 Operating System

Each local processor shall contain an operating system that controls and schedules that local processor's activities in real time. The local processor shall maintain a point database in its memory that includes all parameters, constraints, and the latest value or status of all points connected to that local processor. The execution of local processor application programs shall utilize the data in memory resident files. The operating system shall include a real time clock function that maintains the seconds, minutes, hours, date and month, including day of the week. Each local processor real time clock shall be automatically synchronized with the central station at least once per day to plus or minus 10 seconds. The time synchronization shall be accomplished automatically, without operator action and without requiring system shutdown.

##### 2.5.1.1 Startup

The local processor shall have startup software that causes automatic commencement of operation without human intervention, including startup of all connected Input/Output functions. A local processor restart program based on detection of power failure at the local processor shall be included in the local processor software. The startup software shall initiate operation of self-test diagnostic routines. Upon failure of the local processor, if the database and application software are no longer

resident, the local processor shall not restart and systems shall remain in the failure mode indicated until the necessary repairs are made. If the database and application programs are resident, the local processor shall immediately resume operation.

#### 2.5.1.2 Operating Mode

Each local processor shall control and monitor inputs and outputs as specified, independent of communications with the central station. Alarms, status changes and other data shall be transmitted to the central station when communications circuits are operable. If communications are not available, each local processor shall function in a stand-alone mode and operational data, including the status and alarm data normally transmitted to the central station shall be stored for later transmission to the central station. Storage for the latest 1024 events shall be provided at each local processor. Each local processor shall accept software downloaded from the central station.

#### 2.5.1.3 Failure Mode

Upon failure for any reason, each local processor shall perform an orderly shutdown and force all local processor outputs to a predetermined (failure mode) state, consistent with the failure modes shown and the associated control device.

#### 2.5.2 Functions

The Contractor shall provide software necessary to accomplish the following functions, as appropriate, fully implemented and operational, within each local processor.

- a. Monitoring of inputs.
- b. Control of outputs.
- c. Reporting of alarms automatically to the central station.
- d. Reporting of sensor and output status to central station upon request.
- e. Maintenance of real time, automatically updated by the central station at least once a day.
- f. Communication with the central station.
- g. Execution of local processor resident programs.
- h. Diagnostics.
- i. Download and upload data to and from the central station.

#### 2.6 INTERIOR SENSORS AND CONTROL DEVICES

##### 2.6.1 Balanced Magnetic Switch (BMS)

The BMS shall detect a 1/4 inch of separating relative movement between the magnet and the switch housing. Upon detecting such movement, the BMS shall transmit an alarm signal to the alarm annunciation system.

#### 2.6.1.1 BMS Subassemblies

The BMS shall consist of a switch assembly and an actuating magnet assembly. The switch mechanism shall be of the balanced magnetic type. Each switch shall be provided with an overcurrent protective device, rated to limit current to 80 percent of the switch capacity. Switches shall be rated for a minimum lifetime of 1,000,000 operations. The magnet assembly shall house the actuating magnet.

#### 2.6.1.2 Housing

The housings of surface mounted switches and magnets shall be made of nonferrous metal and shall be weatherproof. The housings of recess mounted switches and magnets shall be made of nonferrous metal or plastic.

#### 2.6.1.3 Remote Test

A remote test capability shall be provided. The remote test shall be initiated when commanded by the alarm annunciation system. The remote test shall activate the sensor's switch mechanism causing an alarm signal to be transmitted to the alarm annunciation system. The remote test shall simulate the movement of the actuating magnet relative to the switch subassembly.

#### 2.6.2 Glass Break Sensor, Piezoelectric

The glass break sensor shall detect high frequency vibrations generated by the breaking of glass while ignoring all other mechanical vibrations. An alarm signal shall be transmitted to the alarm annunciation system upon detecting such frequencies.

##### 2.6.2.1 Sensor Element, Piezoelectric

The sensor element shall consist of piezoelectric crystals. The sensor element housing shall be designed to be mounted directly to the glass surface being protected. Only the adhesive recommended by the manufacturer of the sensor shall be used to mount detectors to glass. The detection pattern of a sensor element shall be circular with at least a 5 foot radius on a continuous pane of glass. A factory installed hookup cable of not less than 6 feet shall be included with each sensor. The sensor element shall not exceed 4 square inches. The sensor element shall be equipped with a light emitting diode (LED) activation indicator. The activation indicator shall light when the sensor responds to the high frequencies associated with breaking glass. The LED shall be held on until it is turned off manually at the sensor signal processor or by command from the alarm annunciation system.

##### 2.6.2.2 Sensor Signal Processor, Piezoelectric

The sensor signal processor shall process the signals from the sensor element and provide the alarm signal to the alarm annunciation system. The sensitivity of the sensor shall be adjustable by controls within the sensor signal processor. The controls shall not be accessible when the sensor signal processor housing is in place. The sensor signal processor may be integral with the sensor or may be a separate assembly.

##### 2.6.2.3 Glass Break Simulator, Piezoelectric

The Contractor shall provide a device that can induce frequencies into the

protected pane of glass that will simulate breaking glass to the sensor element without causing damage to the pane of glass.

### 2.6.3 Glass Break Sensor, Acoustic

The glass break sensor shall detect high frequency vibrations generated by the breaking of glass while ignoring all other mechanical vibrations. An alarm signal shall be transmitted upon detecting such frequencies to the alarm annunciation system.

#### 2.6.3.1 Sensor Element, Acoustic

The sensor element shall be a microprocessor based digital device. The sensor shall detect breakage of plate, laminated, tempered, and wired glass while rejecting common causes of nuisance alarms. The detection pattern of the sensor element shall be a range of 20 feet minimum. The sensor element shall be equipped with a light emitting diode (LED) activation indicator. The activation indicator shall light when the sensor responds to the high frequencies associated with breaking glass. The LED shall be held on until it is turned off manually at the sensor signal processor or by command from the alarm annunciation system.

#### 2.6.3.2 Sensor Signal Processor, Acoustic

The sensor signal processor shall process the signals from the sensor element and provide the alarm signal to the alarm annunciation system. The sensitivity of the sensor shall be adjustable by controls within the sensor signal processor. The controls shall not be accessible when the sensor signal processor housing is in place. The sensor signal processor may be integral with the sensor or may be a separate assembly.

#### 2.6.3.3 Glass Break Simulator, Acoustic

The contractor shall provide a device that can simulate breaking glass to the sensor. The device shall be rated for use with the specific sensor selected. The simulator shall not cause damage to the pane of glass.

### 2.6.4 Duress Alarm Switches

Duress alarm switches shall provide the means for an individual to covertly notify the alarm annunciation system that a duress situation exists. Provide a duress alarm at the main entrance security entry control point room.

#### 2.6.4.1 Footrail

Footrail duress alarms shall be designed to be foot activated and floor mounted. No visible or audible alarm or noise shall emanate from the switch when activated. The switch housing shall shroud the activating lever to prevent accidental activation. Switches shall be rated for a minimum lifetime of 50,000 operations.

#### 2.6.4.2 Push-button

Latching push-button duress alarm switches shall be designed to be activated by depressing a push-button located on the duress switch housing. No visible or audible alarm or noise shall emanate from the switch. The switch housing shall shroud the activating button to prevent accidental activation. Switches shall be rated for a minimum lifetime of 50,000

operations.

#### 2.6.5 Passive Infrared Motion Sensor

The passive infrared motion sensor shall detect changes in the ambient level of infrared emissions caused by the movement of a standard intruder within the sensor's field of view. Upon detecting such changes, the sensor shall transmit an alarm signal to the alarm annunciation system. The sensor shall detect a change in temperature of no more than 2.5 degrees F, and shall detect a standard intruder traveling within the sensor's detection pattern at a speed of 0.3 to 7.5 feet per second across 2 adjacent segments of the field of view. Emissions monitored by the sensor shall be in the 8 to 14 micron range. The sensor shall be adjustable to obtain the coverage pattern shown. The sensor shall be equipped with a temperature compensation circuit.

##### 2.6.5.1 Test Indicator, Passive Infrared

The passive infrared motion sensor shall be equipped with an LED walk test indicator. The walk test indicator shall not be visible during normal operations. When visible, the walk test indicator shall light when the sensor detects an intruder. The sensor shall either be equipped with a manual control, located within the sensor's housing, to enable/disable the test indicator or the test indicator shall be located within the sensor housing so that it can only be seen when the housing is open or removed.

##### 2.6.5.2 Remote Test, Passive Infrared

A remote test capability shall be provided. The remote test hardware may be integral to the sensor or a separate piece of equipment. The remote test shall be initiated when commanded by the alarm annunciation system. The remote test shall excite the sensing element and associated electronics causing an alarm signal to be transmitted to the alarm annunciation system. The sensor stimulation generated by the remote test hardware shall simulate a standard intruder moving within the sensor's detection pattern.

#### 2.6.6 Capacitance Proximity Sensor

The capacitance sensor shall detect the change in capacitance of at least 20 picofarads between an insulated asset and ground. The sensor shall detect a standard intruder approaching or touching the protected asset. Upon detecting such a change, the sensor shall transmit an alarm signal to the alarm annunciation system. The sensor shall be able to protect multiple assets. The sensitivity of the sensor shall be adjustable by controls within the sensor. The controls shall not be accessible when the sensor housing is in place. Insulator blocks shall be provided for each asset to be protected by the sensor.

##### 2.6.6.1 Test Indicator, Capacitance

The sensor shall be equipped with an LED walk test indicator. The walk test indicator shall not be visible during normal operations. When visible, the walk test indicator shall light when the sensor detects an intruder. The sensor shall either be equipped with a manual control, located within the sensor's housing, to enable/disable the test indicator or the test indicator shall be located within the sensor housing so that it can only be seen when the housing is open or removed.

##### 2.6.6.2 Remote Test, Capacitance

A remote test capability shall be provided. The remote test hardware may be integral to the sensor or a separate piece of equipment. The remote test shall be initiated when commanded by the alarm annunciation system. The remote test shall excite the sensing element and associated electronics causing an alarm signal to be transmitted to the alarm annunciation system. The sensor stimulation generated by the remote test hardware shall simulate a standard intruder moving within the sensor's detection pattern.

#### 2.6.7 Video Motion Sensor (Interior)

The video motion sensor shall detect changes in the video signal within a user defined detection zone. The system shall detect changes in the video signal corresponding to a standard intruder moving within the defined detection zone and wearing clothing with a reflectivity that differs from that of the background scene by a factor of 2. All other changes in the video signal shall be rejected by the sensor. Upon detecting such changes, the sensor shall transmit an alarm signal to the alarm annunciation system.

The sensor shall include the controls and method needed by the operator to define and adjust the sensor detection zone within the video picture. The number of detection zones, the size of the detection zones, and the sensitivity of the detection zones shall be user definable. The sensor shall be a modular system that allows for expansion or modification of the number of inputs. The video inputs shall accept composite video as defined in EIA 170. Sensor controls shall be mounted on the front panel or in an adjacent rack panel. The sensor shall not require external sync for operation. One alarm output shall be provided for each video input. The number of video inputs and alarm outputs shall be as shown. All components, cables, power supplies, and other items needed for a complete video motion sensor shall be provided. Sensor equipment shall be rack mounted in a standard 19 inch rack as described in EIA ANSI/EIA-310-D. The rack shall include hardware required to mount the sensor components.

#### 2.6.8 Access/Secure Switches

An access/secure switch shall be used to place a protected zone in the ACCESS or SECURE mode. The switch shall consist of a double pull key-operated switch housed in a NEMA 12 equivalent enclosure. The switch shall disable zone sensor alarm outputs, but shall not disable tamper alarms, duress alarms, and other 24 hr sensors, as shown.

### 2.7 EXTERIOR INTRUSION SENSORS

#### 2.7.1 Video Motion Sensor (Exterior)

The video motion sensor shall detect changes in the video signal within a user defined detection zone. The system shall detect changes in the video signal corresponding to a standard intruder moving within the defined detection zone and wearing clothing with a reflectivity that differs from that of the background scene by a factor of 2. All other changes in the video signal shall be rejected by the sensor. Upon detecting such changes, the sensor shall transmit an alarm signal to the alarm annunciation system.

The sensor shall include the controls and method needed by the operator to define and adjust the sensor detection zone within the video picture. The number of detection zones, the size of the detection zones, and the sensitivity of the detection zones shall be user definable. The sensor shall be a modular system that allows for expansion or modification of the number of inputs. The video inputs shall accept composite video as defined in EIA 170. Sensor controls shall be mounted on the front panel or in an

adjacent rack panel. The sensor shall not require external sync for operation. One alarm output shall be provided for each video input. The number of video inputs and alarm outputs shall be as shown. Components, cables, power supplies, and other items needed for a complete video motion sensor shall be provided. Sensor equipment shall be rack mounted in a standard 19 inch rack as described in EIA ANSI/EIA-310-D. The rack shall include hardware required to mount the sensor components.

## 2.8 ENTRY CONTROL DEVICES

### 2.8.1 Card Readers and Credential Cards

Entry control card readers shall use unique coded data stored in or on a compatible credential card as an identifier. The card readers shall be swipe-through with PIN identification and proximity type, where indicated and shall incorporate built-in heaters or other cold weather equipment to extend the operating temperature range as needed for operation at the site.

Communications protocol shall be compatible with the local processor. The Contractor shall furnish card readers to read magnetic stripe and active proximity detection, respectively to where indicated on the drawings, entry cards, and the matching credential cards. The cards shall contain coded data arranged as a unique identification code stored on or within the card, and of the type readable by the card readers. The Contractor shall include within the card's encoded data, a non-duplicated unique facility identification code common to all credential cards provided at the site. Enrollment equipment to support local encoding of badges including cryptographic and other internal security checks shall be supplied.

#### 2.8.1.1 Magnetic Stripe with PIN

Magnetic stripe card readers shall read credential cards which meet the requirements of ISO 7810, ISO 7811-1, ISO 7811-2, ISO 7811-3, ISO 7811-4, and ISO 7811-5. Magnetic stripe card readers shall also require that a Personal Identification Number (PIN) be input for access. Magnetic stripe credential cards shall use single layer 4000 ersted magnetic tape material.

The magnetic tape material shall be coated with Teflon and affixed to the back of the credential card near the top. The number of bits per inch, number of tracks, and number of unique codes available for the magnetic tape shall be in accordance with ISO 7811-1, ISO 7811-2, ISO 7811-3, ISO 7811-4, and ISO 7811-5.

#### 2.8.1.2 Proximity

Proximity card readers shall use active proximity detection and shall not require contact with the proximity credential card for proper operation. Active detection proximity card readers shall provide power to compatible credential cards through magnetic induction and receive and decode a unique identification code number transmitted from the credential card. The card reader shall read proximity cards in a range from 0 inches to at least 6 inches from the reader. The credential card design shall allow for a minimum of 32,000 unique identification codes per facility.

#### 2.8.1.3 Card Reader Display

The card readers shall include an LED or other visual indicator display. The display shall indicate power on/off, and whether user passage requests have been accepted or rejected.

#### 2.8.1.4 Card Reader Response Time

The card reader shall respond to passage requests by generating a signal to the local processor. The response time shall be 800 milliseconds or less, from the time the card reader finishes reading the credential card until a response signal is generated.

#### 2.8.1.5 Card Reader Power

The card reader shall be powered from the source as shown and shall not dissipate more than 5 Watts.

#### 2.8.1.6 Card Reader Mounting Method

Card readers shall be suitable for surface, semi-flush, pedestal, or weatherproof mounting as required.

#### 2.8.1.7 Credential Card Modification

Entry control cards shall be able to be modified by lamination or direct print process during the enrollment process for use as a picture and identification badge as needed for the site without reduction of readability. The design of the credential cards shall allow for the addition of at least one slot or hole to accommodate the attachment of a clip for affixing the credential card to the type badge holder used at the site.

#### 2.8.1.8 Card Size and Dimensional Stability

Credential cards shall be 2-1/8 x 3-3/8 inches. The credential card material shall be dimensionally stable so that an undamaged card with deformations resulting from normal use shall be readable by the card reader.

#### 2.8.1.9 Card Materials and Physical Characteristics

The credential card shall be abrasion resistant, non-flammable, and present no toxic hazard to humans when used in accordance with manufacturer's instructions. The credential card shall be impervious to solar radiation and the effects of ultra-violet light.

#### 2.8.1.10 Card Construction

The credential card shall be of core and laminate or monolithic construction. Lettering, logos and other markings shall be hot stamped into the credential material or direct printed. The credential card shall incorporate holographic images or phosphorous ink as a security enhancement. The Contractor shall provide a means to allow onsite assembly and lamination of credential cards by Government personnel.

#### 2.8.1.11 Card Durability and Maintainability

The credential cards shall be designed and constructed to yield a useful lifetime of at least 5000 insertions or swipes or 5 years whichever results in a longer period of time. The credential card shall be able to be cleaned by wiping the credential card with a sponge or cloth wet with a soap and water solution.

#### 2.8.2 Keypads

Entry control keypads shall be the combination type with swipe card

reader. Entry control keypads shall use a unique combination of alphanumeric and other symbols as an identifier. Keypads shall contain an integral alphanumeric/special symbols keyboard with symbols arranged in random scrambled order. Communications protocol shall be compatible with the local processor.

#### 2.8.2.1 Keypad Display

Keypads shall include an LED or other type of visual indicator display and provide visual status indications and user prompts. The display shall indicate power on/off, and whether user passage requests have been accepted or rejected. The design of the keypad display or keypad enclosure shall limit the maximum horizontal and vertical viewing angles of the keypad. The maximum horizontal viewing angle shall be plus and minus 5 degrees or less off a vertical plane perpendicular to the plane of the face of the keypad display. The maximum vertical viewing angle shall be plus and minus 15 degrees or less off a horizontal plane perpendicular to the plane of the face of the keypad display.

#### 2.8.2.2 Keypad Response Time

The keypad shall respond to passage requests by generating a signal to the local processor. The response time shall be 800 milliseconds or less from the time the last alphanumeric symbol is entered until a response signal is generated.

#### 2.8.2.3 Keypad Power

The keypad shall be powered from the source as shown and shall not dissipate more than 150 Watts.

#### 2.8.2.4 Keypad Mounting Method

Keypads shall be suitable for surface, semi-flush, pedestal, or weatherproof mounting as required.

#### 2.8.2.5 Keypad Duress Codes

Keypads shall provide a means for users to indicate a duress situation by entering a special code.

### 2.8.3 Card Readers With Integral Keypad

#### 2.8.3.1 Magnetic Stripe

The magnetic stripe card reader, as specified in paragraph Card Readers And Credential Cards and paragraph Magnetic Stripe, shall be equipped with integral keypads as specified in paragraph Keypads.

#### 2.8.3.2 Proximity

The proximity card reader, as specified in paragraph Card Readers And Credential Cards and paragraph Proximity, shall be equipped with integral keypads as specified in paragraph Keypads.

### 2.8.4 Personal Identity Verification Equipment

Entry control personnel identity verification equipment shall use a unique personal characteristic or unique personal physiological measurement to

establish the identity of authorized, enrolled personnel. Personnel identity verification equipment shall include a means to construct individual templates or profiles based upon measurements taken from the person to be enrolled. This template shall be stored as part of the System Reference Database Files. The stored template shall be used as a comparative base by the personnel identity verification equipment to generate appropriate signals to the associated local processors.

#### 2.8.5 Portal Control Devices

##### 2.8.5.1 Push-button Switches

The Contractor shall provide momentary contact, back lighted push buttons and stainless steel switch enclosures for each push button as shown. Switch enclosures shall be suitable for flush, or surface mounting as required. Push buttons shall be suitable for flush mount in the switch enclosures. The push button switches shall meet the requirements of NEMA 250 for the area in which they are to be installed. Where multiple push buttons are housed within a single switch enclosure they shall be stacked vertically with each push button switch labeled with 1/4 inch high text and symbols as required. The push button switches shall be connected to the local processor associated with the portal to which they are applied and shall operate the appropriate electric strike, electric bolt or other facility release device. Switches shall have a minimum continuous current rating of 10 Amperes at 120 Vac or 5 Amperes at 240 Vac. The push button switches shall have double-break silver contacts that will make 720 VA at 60 amperes and break 720 VA at 10 amperes.

##### 2.8.5.2 Panic Bar Emergency Exit With Alarm

Entry control portals shall include panic bar emergency exit hardware as shown. Panic bar emergency exit hardware shall provide local alarm annunciation and alarm communications to the portal's local processor. The panic bar shall include a conspicuous warning sign with 1 inch high, red lettering notifying personnel that an alarm will be annunciated if the panic bar is operated. Operation of the panic bar hardware shall generate an intrusion alarm. The panic bar, except for local alarm annunciation and alarm communications, shall depend upon a mechanical connection only and shall not depend upon electric power for operation. The panic bar shall be compatible with mortise or rim mount door hardware and shall operate by retracting the bolt.

##### 2.8.5.3 Electromagnetic Lock

Electromagnetic locks shall contain no moving parts and shall depend solely upon electromagnetism to secure a portal by generating at least 1200 pounds of holding force. The electromagnetic lock shall release automatically in case of power failure and shall require manual reset to resume normal function. The lock shall interface with the local processors without external, internal or functional alteration of the local processor. The electromagnetic lock shall incorporate an end of line resistor to facilitate line supervision by the system.

a. Armature: The electromagnetic lock shall contain internal circuitry to eliminate residual magnetism and inductive kickback. The actuating armature shall operate on 12 or 24 Volts dc and shall not dissipate more than 12 Watts. The holding current shall be not greater than 500 milliamperes. The actuating armature shall take not more than 300 milliseconds to change the status of the lock from fully secure to fully

open or fully open to fully secure.

b. Tamper Resistance: The electromagnetic lock mechanism shall be encased in hardened guard barriers to deter forced entry.

c. Mounting Method: The door electromagnetic lock shall be suitable for use with single and double door with mortise or rim type hardware as shown, and shall be compatible with right or left hand mounting.

## 2.9 ENTRY CONTROL SOFTWARE

### 2.9.1 Interface Device

The entry control software shall control passage. The decision to grant or deny passage shall be based upon identifier data to be input at a specific location. If all conditions are met, a signal shall be sent to the input device location to activate the appropriate electric strike, bolt, electromagnetic lock or other type of portal release or facility interface device.

### 2.9.2 Operator Interface

Entry control operation shall be entirely automatic under control of the central station and local processors except for simple operations required for map display, alarm acknowledgment, zone and portal status change operations, audible or visual alarm silencing and audio annunciation. The system shall immediately annunciate changes in zone and portal status. The alarm printer shall print a permanent record of each alarm and status change. The map displays or graphics screens shall display the current status of system zones and portals. The central station shall immediately display the current status of any zone or portal upon command. While the system is annunciating an unacknowledged zone or portal alarm, keyboard operations at the central station, other than alarm acknowledgment, shall not be possible. The system shall provide the capability to change zone and portal status from alarm (after alarm acknowledgment) or access to secure; from alarm (after alarm acknowledgment) or secure to access, or from access to secure by simple control operations. If the operator attempts to change zone status to secure while there is an alarm output for that zone or portal, the system shall immediately annunciate an alarm for that zone or portal.

### 2.9.3 Entry Control Functions

#### 2.9.3.1 Multiple Security Levels

The system shall have multiple security levels. Each of the security levels shall be delineated by facility barriers. Access to each security level shall be through portals in the facility barriers using designated entry control procedures. The system shall provide at least 8 security levels. Any attempt to access an area beyond an individual's security level shall initiate an access denial alarm.

#### 2.9.3.2 Two person rule

The system shall provide a 2 person rule feature. When a portal is designated as a 2 person rule portal, it shall not allow passage unless 2 valid identifiers are presented in the proper sequence. The scheme shall be designed so that only the first 2 valid identifiers and the last 2 valid identifiers pass together.

### 2.9.3.3 Anti-Passback

Portals as shown shall incorporate anti-passback functions. Anti-passback functions and identifier tracking shall be system-wide for portals incorporating anti-passback. Once an authorized, enrolled individual has passed through a portal using entry control procedures, the system shall not allow use of the same identifier to pass through any portal at the same security level until the individual has egressed through a portal at this same security level using entry control procedures. Any attempt to violate anti-passback procedures shall initiate an access denial alarm. Portals that do not incorporate anti-passback functions shall allow egress from the area by a push-button switch for activation of the facility interface device. Portal egress switch shall be located as shown.

### 2.9.3.4 Immediate Access Change

The system shall provide functions to disenroll and deny access to any identifier or combination of identifiers without consent of the individual or recovery of a credential. The design of the system shall provide entry change capability to system operators and managers with appropriate passwords at the system operator or enrollment consoles.

### 2.9.3.5 Multiple Time Zones

The system shall provide multiple time zone entry control. Personnel enrolled in the system shall only be allowed access to a facility during the time of day they are authorized to access the facility. Time zone access control shall also include the ability to specify beginning and ending dates that an individual will be authorized to access a facility. The system shall provide automatic activation and deactivation of entry authorization. The design of the system shall provide at least 24 time zones with overlapping time zones. The system shall provide a means for system operators with proper password clearance, to define custom names for each time zone, and to change the time zone's beginning and ending times through the system operator and enrollment interfaces. The system shall automatically disenroll individuals at the end of their predefined facility access duration. Any attempt during a 24 hour period by an individual or an identifier to gain facility entry outside of the authorized time zone shall initiate an entry denial alarm.

### 2.9.3.6 Guard Tour

The system shall provide guard tour monitoring capability. The system shall monitor a security guard's progress and timing during performance of routine inspections. The system shall provide a means for operators and managers with appropriate password levels to define facility check points, and create time windows of the shortest and longest times necessary to get from one check point on the tour to the next. The time window between check points shall be adjustable over a range of at least 1 minute to 1 hour with a resolution of at least 1 minute. The system shall annunciate an alarm if the guard does not log in at the next check point within the allotted time window. Time measurements shall be reset at each terminal device check point when the guard logs in so that cumulative time variations do not result in false alarms. The guard tour shall have a random start/stop function so that a tour may start from any designated station at any designated time, and in either a forward or reverse direction to ensure that patrol patterns cannot be deduced by observation. The system operator shall be able to reposition or halt a guard during a

tour to allow time for investigations to be made. The system guard tour feature shall be able to store at least 128 programmed guard tours in memory with at least 12 tours active at any one time, and at least 24 check points for each tour. Guard tours shall be configured as needed for the site.

#### 2.9.3.7 Elevator Control

The system shall control elevator operation with entry control terminal devices. The elevator's standard control equipment, components, and actuators shall serve as the facility interface. System components and subsystems shall interface to standard elevator control equipment without modification of the elevator control equipment. The system shall provide means to define access controlled floors of a facility, deny access to these floors by unauthorized individuals, and implement all other system functions as specified.

#### 2.9.4 Electronic Entry Control System Capacities

The system shall be designed and configured to provide the following capacities.

##### 2.9.4.1 Enrollees

The system shall be configured for 7,000 enrollees. The system shall provide a facility-tailorable reference file database containing personal, access authorization, identifier and verification data for each enrollee as required.

##### 2.9.4.2 Transaction History File Size

The system capacity shall be at least the amount of transactions for the system during 1 year without any loss of transaction data.

#### 2.9.5 Entry Control System Alarms

The system shall annunciate an alarm when the following conditions occur. Alarms shall be annunciated at the console both audibly and visually. An alarm report shall also be printed on the system printer. The alarm annunciation shall continue until acknowledged by the system operator. Only 1 control key shall be needed to acknowledge an alarm. The system shall control, monitor, differentiate, rank, annunciate, and allow operators to acknowledge, in real time, alarm signals generated by system equipment. The system shall also provide a means to define and customize the annunciation of each alarm type. The system shall use audio and visual information to differentiate the various types of alarms. Each alarm type shall be assigned an audio and a unique visual identifier.

##### 2.9.5.1 Duress

The system shall annunciate a duress alarm when a duress code is entered at a keypad or a duress switch is activated. Duress alarms shall be annunciated in a manner that distinguishes them from all other system alarms. Duress alarms shall not be annunciated or otherwise indicated locally nor shall a duress alarm cause any special or unusual indications at the portal or area initiating the duress alarm. Individual privileges shall be carried out the same as an authorized entry to the protected area.

Duress alarms shall only be annunciated at the central station and remote displays. Alarms shall be annunciated on the monitor and shall be logged

on the printer.

#### 2.9.5.2 Guard Tour

The system shall annunciate an alarm when a security guard does not arrive at a guard tour check point during the defined time window or if check points are passed out of the prescribed order.

#### 2.9.5.3 Entry Denial

The system shall annunciate an alarm when an attempt has been made to pass through a controlled portal and entry has been denied.

#### 2.9.5.4 Portal Open

The system shall annunciate an alarm when an entry controlled portal has been open longer than a predefined time delay. The time delay shall be adjustable, under operator control, over a range of at least 1 second to 1 minute with a maximum resolution of 1 second.

#### 2.9.5.5 Bolt Not Engaged

The system shall annunciate an alarm when the bolt at an entry controlled portal has been open longer than a predefined time delay and generate an entry control alarm. The time delay shall be adjustable, under operator control, over a range of at least 1 second to 1 minute with a maximum resolution of 1 second.

#### 2.9.5.6 Strike Not Secured

The system shall annunciate an alarm when the strike at an entry controlled portal has been left unsecured longer than a predefined time delay and generate an entry control alarm. The time delay shall be adjustable, under operator control, over a range of at least 1 second to 1 minute with a maximum resolution of 1 second.

#### 2.9.5.7 Alarm Shunting/System Bypass

The system shall provide a means to ignore operator selected alarm types at operator selected portals in order to allow standard entry control procedures to be bypassed (shunted). Predefined alarm shunting shall only be available to system operators with the proper password. The system shall also provide for predefined alarm shunting based upon time zones. This capability shall only apply to the entry control alarm type.

### 2.10 WIRE AND CABLE

The Contractor shall provide all wire and cable not indicated as Government furnished equipment. Wiring shall meet NFPA 70 standards.

#### 2.10.1 Above Ground Sensor Wiring

Sensor wiring shall be 20 AWG minimum, twisted and shielded, 2, 3, 4, or 6 pairs to match hardware. Multiconductor wire shall have an outer jacket of PVC.

#### 2.10.2 Direct Burial Sensor Wiring

Sensor wiring shall be 20 AWG minimum, twisted and shielded, 2, 3, 4, or 6

pairs to match hardware. The construction of the direct burial cable shall be as specified in Section 16792 WIRELINE DATA TRANSMISSION SYSTEM.

### 2.10.3 Local Area Network (LAN) Cabling

LAN cabling shall be in accordance with EIA ANSI/TIA/EIA-568-A, category 5.

## PART 3 EXECUTION

### 3.1 GENERAL REQUIREMENTS

The Contractor shall install all system components, including Government furnished equipment, and appurtenances in accordance with the manufacturer's instructions, IEEE C2 and as shown. The contractor shall furnish necessary interconnections, services, and adjustments required for a complete and operable system as specified and shown. Control signal, communications, and data transmission line grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.

#### 3.1.1 Installation

The contractor shall install the system in accordance with the standards for safety, NFPA 70, UL 681, UL 1037 and UL 1076, and the appropriate installation manual for each equipment type. Components within the system shall be configured with appropriate service points to pinpoint system trouble in less than 20 minutes. Minimum size of conduit shall be 1/2 inch. DTS shall not be pulled into conduits or placed in raceways, compartments, outlet boxes, junction boxes, or similar fittings with other building wiring. Flexible cords or cord connections shall not be used to supply power to any components of the system, except where specifically noted. All other electrical work shall be as specified in Section 16415 and as shown.

#### 3.1.2 Enclosure Penetrations

Enclosure penetrations shall be from the bottom unless the system design requires penetrations from other directions. Penetrations of interior enclosures involving transitions of conduit from interior to exterior, and penetrations on exterior enclosures shall be sealed with rubber silicone sealant to preclude the entry of water. The conduit riser shall terminate in a hot-dipped galvanized metal cable terminator. The terminator shall be filled with an approved sealant as recommended by the cable manufacturer, and in a manner that does not damage the cable.

#### 3.1.3 Cold Galvanizing

Field welds and/or brazing on factory galvanized boxes, enclosures, conduits, etc., shall be coated with a cold galvanized paint containing at least 95 percent zinc by weight.

#### 3.1.4 Current Site Conditions

The Contractor shall verify that site conditions are in agreement with the design package. The Contractor shall report any changes in the site, or conditions that will affect performance of the system to the Government in a report as defined in paragraph Group II Technical Data Package. The Contractor shall not take any corrective action without written permission from the Government.

### 3.1.5 Existing Equipment

The Contractor shall connect to and utilize existing base Vindicator equipment. The Contractor shall perform a field survey, including testing and inspection of all existing system equipment and DTS intended to be incorporated into the system, and furnish a report to the Government as part of the site survey report as defined in paragraph Group II Technical Data Package. For those items considered nonfunctioning, the report shall include specification sheets, or written functional requirements to support the findings and the estimated cost to correct the deficiency. As part of the report, the Contractor shall include the scheduled need date for connection to all existing equipment. The Contractor shall make written requests and obtain approval prior to disconnecting any signal lines and equipment, and creating equipment downtime. Such work shall proceed only after receiving Government approval of these requests. If any device fails after the Contractor has commenced work on that device, signal or control line, the Contractor shall diagnose the failure and perform any necessary corrections to his equipment and work. The Government is responsible for maintenance and the repair of Government equipment. The Contractor shall be held responsible for repair costs due to Contractor negligence or abuse of Government equipment.

### 3.1.6 Installation Software

The Contractor shall load software as specified and required for an operational system, including data bases and specified programs. Upon successful completion of the endurance test, the Contractor shall provide original and backup copies on CD-ROM of all accepted software, including diagnostics.

## 3.2 SYSTEM STARTUP

Satisfaction of the requirements below does not relieve the Contractor of responsibility for incorrect installations, defective equipment items, or collateral damage as a result of Contractor work/equipment. The Contractor shall not apply power to the system until after:

- a. System equipment items and DTS have been set up in accordance with manufacturer's instructions.
- b. A visual inspection of the system has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.
- c. System wiring has been tested and verified as correctly connected.
- d. System grounding and transient protection systems have been verified as properly installed.
- e. Power supplies to be connected to the system have been verified as the correct voltage, phasing, and frequency.

## 3.3 SUPPLEMENTAL CONTRACTOR QUALITY CONTROL

The Contractor shall provide the services of technical representatives who are familiar with all components and installation procedures of the installed system; and are approved by the Contracting Officer. These representatives shall be present on the job site during the preparatory and

initial phases of quality control to provide technical assistance. These representatives shall also be available on an as needed basis to provide assistance with follow-up phases of quality control. These technical representatives shall participate in the testing and validation of the system and shall provide certification that their respective system portions meet the contractual requirements.

### 3.4 TESTING

#### 3.4.1 General Requirements for Testing

The Contractor shall provide personnel, equipment, instrumentation, and supplies necessary to perform site testing. The Government will witness all performance verification and endurance testing. Written permission shall be obtained from the Government before proceeding with the next phase of testing. Original copies of all data produced during predelivery, performance verification and endurance testing, shall be turned over to the Government at the conclusion of each phase of testing, prior to Government approval of the test.

#### 3.4.2 Predelivery Testing

The Contractor shall assemble the test system as specified, and perform tests to demonstrate that performance of the system complies with specified requirements in accordance with the approved predelivery test procedures. The tests shall take place during regular daytime working hours on weekdays. Model numbers of equipment tested shall be identical to those to be delivered to the site. Original copies of all data produced during predelivery testing, including results of each test procedure, shall be delivered to the Government at the conclusion of predelivery testing, prior to Government approval of the test. The test report shall be arranged so that all commands, stimuli, and responses are correlated to allow logical interpretation.

#### 3.4.3 Test Setup

The predelivery test setup shall include the following:

- a. All central station equipment.
- b. At least 1 of each type DTS link, but not less than 2 links, and associated equipment to provide a fully integrated system.
- c. The number of local processors shall equal the amount required by the site design.
- d. At least 1 of each type sensor used.
- e. Enough sensor simulators to provide alarm signal inputs to the system equal to the number of sensors required by the design. The alarm signals shall be manually or software generated.
- f. At least 1 of each type of terminal device used.
- g. At least 1 of each type of portal configuration with all facility interface devices as specified or shown.
- h. Equipment as specified in Section 16751 CLOSED CIRCUIT TELEVISION SYSTEMS when required.

i. The Contractor shall prepare test procedures and reports for the predelivery test, and shall deliver the predelivery test procedures to the Government for approval. The final predelivery test report shall be delivered after completion of the predelivery test.

#### 3.4.4 Contractor's Field Testing

The Contractor shall calibrate and test all equipment, verify DTS operation, place the integrated system in service, and test the integrated system. Ground rods installed by the Contractor shall be tested as specified in IEEE Std 142. The Contractor shall deliver a report describing results of functional tests, diagnostics, and calibrations, including written certification to the Government that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing. The report shall also include a copy of the approved performance verification test procedure.

#### 3.4.5 Performance Verification Test

The Contractor shall demonstrate that the completed system complies with the contract requirements. Using approved test procedures, all physical and functional requirements of the project shall be demonstrated and shown.

The performance verification test, as specified, shall not be started until after receipt by the Contractor of written permission from the Government, based on the Contractor's written report. The report shall include certification of successful completion of testing as specified in paragraph Contractor's Field Testing, and upon successful completion of training as specified. The Government may terminate testing at any time when the system fails to perform as specified. Upon termination of testing by the Government or by the Contractor, the Contractor shall commence an assessment period as described for Endurance Testing Phase II. Upon successful completion of the performance verification test, the Contractor shall deliver test reports and other documentation as specified to the Government prior to commencing the endurance test.

#### 3.4.6 Endurance Test

a. General: The Contractor shall demonstrate system reliability and operability at the specified throughput rates for each portal, and the Type I and Type II error rates specified for the completed system. The contractor shall calculate false alarm rates and the system shall yield false alarm rates within the specified maximums at the specified probability of detection. The endurance test shall be conducted in phases as specified. The endurance test shall not be started until the Government notifies the Contractor, in writing, that the performance verification test is satisfactorily completed, training as specified has been completed, and correction of all outstanding deficiencies has been satisfactorily completed. The Contractor shall provide 1 operator to operate the system 24 hours per day, including weekends and holidays, during Phase I and Phase III endurance testing, in addition to any Government personnel that may be made available. The Government may terminate testing at any time the system fails to perform as specified. Upon termination of testing by the Government or by the Contractor, the Contractor shall commence an assessment period as described for Phase II. The Contractor shall verify the operation of each terminal device during the last day of the test. Upon successful completion of the endurance test, the Contractor shall deliver test reports and other documentation as specified to the Government prior to acceptance of the system.

b. Phase I Testing: The test shall be conducted 24 hours per day for 15 consecutive calendar days, including holidays, and the system shall operate as specified. The Contractor shall make no repairs during this phase of testing unless authorized by the Government in writing. If the system experiences no failures during Phase I testing, the Contractor may proceed directly to Phase III testing after receipt by the Contractor of written permission from the Government.

c. Phase II Assessment: After the conclusion of Phase I, the Contractor shall identify all failures, determine causes of all failures, repair all failures, and deliver a written report to the Government. The report shall explain in detail the nature of each failure, corrective action taken, results of tests performed, and shall recommend the point at which testing should be resumed. After delivering the written report, the Contractor shall convene a test review meeting at the jobsite to present the results and recommendations to the Government. The meeting shall not be scheduled earlier than 5 business days after receipt of the report by the Government. As a part of this test review meeting, the Contractor shall demonstrate that all failures have been corrected by performing appropriate portions of the performance verification test. Based on the Contractor's report and the test review meeting, the Government will determine the restart date, or may require that Phase I be repeated. If the retest is completed without any failures, the Contractor may proceed directly to Phase III testing after receipt by the Contractor of written permission from the Government.

d. Phase III Testing: The test shall be conducted 24 hours per day for 15 consecutive calendar days, including holidays, and the system shall operate as specified. The Contractor shall make no repairs during this phase of testing unless authorized by the Government in writing.

e. Phase IV Assessment: After the conclusion of Phase III, the Contractor shall identify all failures, determine causes of failures, repair failures, and deliver a written report to the Government. The report shall explain in detail the nature of each failure, corrective action taken, results of tests performed, and shall recommend the point at which testing should be resumed. After delivering the written report, the Contractor shall convene a test review meeting at the jobsite to present the results and recommendations to the Government. The meeting shall not be scheduled earlier than 5 business days after receipt of the report by the Government. As a part of this test review meeting, the Contractor shall demonstrate that all failures have been corrected by repeating appropriate portions of the performance verification test. Based on the Contractor's report and the test review meeting, the Government will determine the restart date, and may require that Phase III be repeated. The Contractor shall not commence any required retesting until after receipt of written notification by Government. After the conclusion of any retesting which the Government may require, the Phase IV assessment shall be repeated as if Phase III had just been completed.

f. Exclusions: The Contractor will not be held responsible for failures in system performance resulting from the following:

- (1) An outage of the main power in excess of the capability of any backup power source, provided that the automatic initiation of all backup sources was accomplished and that automatic shutdown and restart of the ESS performed as specified.

(2) Failure of a Government furnished communications circuit, provided that the failure was not due to Contractor furnished equipment, installation, or software.

(3) Failure of existing Government owned equipment, provided that the failure was not due to Contractor furnished equipment, installation, or software.

(4) The occurrence of specified nuisance alarms.

(5) The occurrence of specified environmental alarms.

### 3.5 RELIABILITY CALCULATION

This exponential calculation depends on the test duration and assumes that the Mean Time Between Failures (MTBF) does not change after each repair; and that the probability of failure is constant throughout the useful life of the component regardless of how many failures the system has experienced. This calculation does not account for effects of aging.

#### 3.5.1 Definition of Reliability

System reliability is calculated in terms of overall MTBF where the component reliability furnished by vendors is already expressed as MTBF. The mathematical combination of the component MTBF values is defined as the system reliability,  $R(t)$ ; the probability that the system will perform its function during a given time period under specified conditions. In this calculation, each component reliability is determined; the component reliabilities are combined as dictated by the system configuration; and the overall MTBF is computed as follows:

$R(t) = e^{-t/MTBF}$ ; where:

MTBF = mean time between failure

t = duration of test period

e = base of natural logarithms

When  $t/MTBF$  is less than 0.1, the reliability can be approximated as follows:

$R(t) = 1 - (t/MTBF)$ : A specific reliability value can be interpreted by noting that a value of  $R(t)$  greater than  $1/e$  (which equals 0.37) indicates that the MTBF value is greater than the test duration.

#### 3.5.2 Series and Parallel Components

Components are in series if failure of 1 component causes a system failure. Reliability of components in series is a product of the individual reliabilities:

$R = 1 - (r_1)(r_2)(r_3)...(r_n)$ . If components in a system are redundant (parallel), reliability is computed as follows:

$R = 1 - \{(1-r_1)(1-r_2)...(1-r_n)\}$ . If a system has parallel components, an equivalent series reliability is computed for each set of parallel components. The reliability of the system is then computed as the product of series and equivalent series reliabilities.

### 3.5.3 Calculation Procedure

The Contractor shall prepare a table showing the following data:

- a. Name and quantity of each component.
- b. Each component identified as series or parallel. (For example, if there are 2 printers, the failure of 1 will not cause a system failure).
- c. MTBF for each component.
- d. Single unit reliability:  $R = e(-t/MTBF)$ , where  $t = 1,000$  hour test period.
- e. Total Component Reliability (TCR) where  $TCR = R^n$ , and  $n =$  number of components. For parallel components,  $TCR = 1 - (1-R)^n$ , where  $n =$  number of components.
- f. Cumulative Reliability (CUMR) is the product of total component reliability; for example:  $CUMR_4 = (TCR_1) (TCR_2) (TCR_3) (TCR_4) = (CUMR_3) (TCR_4)$
- g. Cumulative MTBF =  $-1,000/LN (CUMR)$ ; where  $LN (CUMR)$  is the natural logarithm of (CUMR). As an example:  $CUM.MTBF = -1,000/LN (CUMR_4)$

### 3.5.4 Sample Calculations

MTBF is not calculated for sensors and controls. Input/Output functions are part of the local processor. Any Input/Output failure not attributable to sensors and controls constitutes a local processor failure and is thus reflected in the local processor MTBF. MTBF for other components are based on the lowest values provided by vendors. The calculation shall be based on the following configuration:

- a. All central station equipment.
  - b. Data Transmission System (DTS) equipment associated with one DTS circuit, but excluding the circuit itself.
  - c. Sixteen local processors with all the functions as specified in paragraph Local Processor.
  - d. Four representative types of devices, per local processor.
- End of Section --

## SECTION 13722

## SOUND MASKING SYSTEM

04/02

## 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.

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70

(2002) National Electrical Code

## 1.2 SYSTEM DESCRIPTION

The sound masking system shall consist of, but not be limited to, electronic noise generators, mixers, amplifiers, wiring, equalizers, controls, transducers (windows and ducts), speakers, and auxiliary components to generate, amplify, distribute, and reproduce digitally synthesized and stabilized pink background noise for sound masking for security in zones of coverage. Provide all equipment and devices that is required for a complete sound masking system as specified herein and in accordance with the the Defense Intelligences Agency criteria.

## 1.2.1 Definitions

- A. Test and Calibration Conditions: Spaces completely furnished but unoccupied, lights and HVAC systems on, HVAC system testing and balancing completed, ceiling components in place.
- B. Covered Spaces: Exterior windows where transducers are installed. Work spaces. Spaces above drop ceilings. Spaces below raised access flooring.
- C. Pink Noise: Random noise signal with equal energy in each octave.
- D. Sound Masking: Covering up of one sound by another.

## 1.2.2 Multi-Channel System

The system shall provide two channels for distribution over an audio network to speakers and glass transducers and duct transducers, as indicated. Each channel shall be separate, and equipment for each channel shall be identical, except for alternate program inputs which shall be suitable for the alternate source specified. The system shall include electronic noise generators, mixers, amplifiers, wiring, equalizers, controls, transducers, and auxiliary components and all accessories required.

## 1.2.3 System Performance

The system shall provide even sound distribution throughout the designated area and zones. The system shall be capable of delivering 75 dB average program level with additional 10 dB peaking margin sound pressure level

(SPL) to any location in the area at an acoustic distortion level below 5 percent total harmonic distortion (THD). Additional performance shall be:

A. Signal Levels: Individually adjustable for each of 14 one-third octave bands centered at 200 through 4000 Hz, for sound-masking noise channels.

B. Sound-Power Level Produced by System: Match NC 40 contour between 400 and 2000 Hz, with smooth roll-off above and below those frequencies.

1. Initial Level: 40 dB, A-weighted.
2. Final Adjusted Level: 40 to 50 dB, A-weighted. Determine final level for each space individually by measurement as specified in Part 3.
3. Measurements: Made under calibration conditions.

C. Maximum Local Variance of Sound-Power Level: 6 dB for the 500-Hz octave band and 3 dB for the 1000-, 2000-, and 4000-Hz octave bands for 75 percent of the locations in covered spaces.

D. Maximum Average Range of Sound-Power-Level Deviation: 2 dB in the 250-, 2000-, and 4000-Hz octave bands and 1.5 dB for the 500- and 1000-Hz octave bands for all locations.

E. Directional Effect: People in covered spaces under calibration conditions cannot determine source of masking sound.

G. Uniformity with Respect to Time: One-minute time-averaged sound-pressure level of any octave band of masking sound from 250 to 8000 Hz remains constant in any space to within a standard deviation of 2 dB when measured over a 30-minute period.

H. Sound Quality: No audible hum or noise from this system in covered spaces when noise generators are off and power amplifiers are on with input volume controls set at 50 percent.

### 1.3 CONTRACTOR QUALIFICATIONS

The system shall be installed by an experienced firm regularly engaged in the installation of high secured installation sound masking systems for the Department of Defense. The contractor shall have a minimum of five years experience installing, testing, and calibrating high secured installations sound masking systems on at least ten different systems. The Contractor must be certified by the manufacturer of the sound masking equipment to install, calibrate and test the complete system. Certification shall be submitted to the Contracting Officer for approval. Submit a list of recent projects and point of contacts with telephone numbers, a minimum of ten, for reference and verification of contractor qualifications.

### 1.4 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-02 Shop Drawings

Sound Masking System; G, AE

Detail drawings consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Note that the contract drawings show layouts based on typical speakers and transducers. The Contractor shall check the layout based on the actual speakers and transducers to be installed and make necessary revisions in the detail drawings. Detail drawings shall also contain complete point to point wiring, schematic diagrams and other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

#### SD-03 Product Data

Spare Parts; G, RE

Spare parts data for each different item of material and equipment specified, after approval of the detail drawings and not later than 2 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

#### SD-06 Test Reports

Approved Test Procedures; G, AE

Test plan and test procedures for the acceptance tests. The test plan and test procedures shall explain in detail, step-by-step actions and expected results to demonstrate compliance with the requirements specified. The procedure shall also explain methods for simulating the necessary conditions of operation to demonstrate system performance.

Acceptance Tests; G, AE

Test reports in booklet form showing all field tests performed to adjust each component and to prove compliance with the specified performance criteria, upon completion and testing of the installed system. The reports shall include the manufacturer, model number, and serial number of test equipment used in each test. Each report shall indicate the final position of controls and operating mode of the system.

#### SD-07 Certificates

Components; G, AE

Copies of current approvals or listings issued by UL, or other nationally recognized testing laboratory for all components.

Materials and Equipment; GA.

Where materials or equipment are specified to conform to the standards of the Underwriters Laboratories (UL) or to be constructed or tested, or both, in accordance with the standards of

the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided conform to such requirements. The label of, or listing by, UL will be acceptable as evidence that the items conform. Either a certification or a published catalog specification data statement, to the effect that the item is in accordance with the referenced ANSI or IEEE standard, will be acceptable as evidence that the item conforms. A similar certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard, by a company listed as a member company of NEMA, will be acceptable as evidence that the item conforms. In lieu of such certification or published data, the Contractor may submit a certificate from a recognized testing agency equipped and competent to perform such services, stating that the items have been tested and that they conform to the requirements listed, including methods of testing of the specified agencies. Compliance with above-named requirements does not relieve the Contractor from compliance with any other requirements of the specifications.

#### Sound Masking System Installer Qualification;; GA, AE

A certification that contains the names and the qualifications of people recommended to perform the sound masking system installation, testing, and calibrating, under this contract. The certification shall indicate that any person recommended to perform actual splicing and terminations has been adequately trained in the proper techniques and have had at least three recent years of experience in the same types of installation. The Contractor shall provide at least one on site person in a supervisory position with a documentable level of competency and experience to supervise all cable pulling operations. A resume shall be provided showing the cable installers' experience in the last three years, including a list of references complete with points of contact, addresses and telephone numbers.

#### SD-10 Operation and Maintenance Data

Sound Masking System, Data Package 3; G  
, AE

Submit data package in accordance with Section 01781, OPERATION AND MAINTENANCE DATA

#### 1.5 DELIVERY AND STORAGE

Equipment placed in storage until installation shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, and other contaminants.

#### 1.6 VERIFICATION OF DIMENSIONS

The Contractor shall become familiar with the details of the work and working conditions, shall verify dimensions in the field, and shall advise the Contracting Officer of any discrepancies before performing the work.

## PART 2 PRODUCTS

## 2.1 STANDARD PRODUCTS

Material and equipment to be provided shall be the standard products of a manufacturer regularly engaged in the manufacture of such products, and shall essentially duplicate material and equipment that have been in satisfactory use at least 5 years. All components used in the system shall be commercial designs that comply with the requirements specified. Equipment shall be supported by a service organization that is within 100 miles of the site.

## 2.2 Component Modularity

Modular plug-in, heavy-duty, industrial-grade integrated circuit devices.

## 2.3 AC Power Supply

AC Supply Voltage Tolerance: 105 to 130 V with no degradation of system performance.

## 2.4 Power Line Surge Protection

Protection from Power Line Surges: Integral surge suppressors listed under UL 1449; complying with IEEE C62.41, Category B; and with the following features:

1. Suppression Level: 300 V.
2. Maximum Response Time: 5 nanoseconds.
3. Circuit: Multistage, using inductors and silicon-avalanche zener diodes or equivalent.
4. Indicator Lamp: Neon or light-emitting diode located on control panel and arranged to extinguish on failure of protection.
5. Fuses: Externally accessible.

## 2.5 System Components Mounting

All electronic components (i.e. amplifiers, equalizers, volume controls, etc.) shall be suitable for mounting in standard 19-inch racks, with connections at rear and controls front of the rack panel and protected by a full length, plastic or glass side hinged door.

## 2.6 NOISE GENERATOR AND FILTER UNITS

Noise generator and filter unit shall have the following minimum characteristics:

- A. Pink Noise Generator: Output octave bands from 30 to 4000 Hz.
- B. Filters for One-Third Octave Bands: Adjustable from 10 dB of boost to 10 dB of cut at each center frequency.
- C. High-Pass Filter: Approximate range of cutoff adjustment is 37 to 400 Hz.
- D. Low-Pass Filter: Approximate range of cutoff adjustment is 3.4 to 20 kHz.
- E. High-Cut Filter: Approximate range of cutoff adjustment is 180 to 9000 Hz with slope varying to 12 dB per octave.

## 2.7 PROGRAMMABLE AUDIO-LEVEL CONTROL UNIT

The programmable audio-level control shall have the following minimum characteristics:

A. Automatic Sound-Power-Level Changes: Six system channel changes, four times per day, and capable of different time settings for each day of week.

B. Level Changes: Programmable from front panel of unit, and automatically incremented over a period long enough for sound-level variations to be imperceptible to occupants of covered spaces.

C. Program Memory: Nonvolatile for one year, minimum, without power. When re-energized after a power outage, control starts at zero level and automatically advances system sound level at same rate used for programmed level changes.

## 2.8 MIXER-PREAMPLIFIER

Mixer-preamplifier shall as a minimum conform to the following specifications:

Rated Output:	18 dB
Frequency Response:	Plus or Minus 1 dB, 20 - 20,000 Hz
Distortion:	Less than 0.2 percent, 20 - 20,000 Hz
Signal to noise:	Microphone - 60 dB Aux - 70 dB
Inputs:	5 independent balanced low-impedence, transformer-isolated
Input Sensitivity:	Microphone - 0.003 volts Aux - 0.125 volts Magnetic Cartridge - 0.0005 volts
Input Channel	
Isolation:	80 dB minimum
Tone Controls:	Plus or Minus 10 dB range at 50 and 15,000 Hz
Power Requirement:	110-125 Vac 60 Hz

## 2.9 EQUALIZER

The equalizer shall be catalog number SMS200 as manufactured by Biamp or approved equal.

## 2.10 POWER AMPLIFIERS

Power amplifiers as a minimum conform to the following specifications:

Rack mounted type in standard 19 inch rack.

Rated power output: 250 watts RMS  
 Frequency Response: Plus or Minus 2 dB, 60-13,000 Hz  
 Distortion: Less than 2 percent at RPO, 600-13,000 Hz  
 Input Impedance: 50 k ohm unbalanced  
 Signal to Noise Ratio: 60 dB or greater, at rated output.  
 Output Impedance: 83.3, 10.4, 8.0, and 4.0 ohms  
 Output voltage: 70.7, 25, 22, and 15.5 volts  
 Power Requirement: 110-125 Vac 60 Hz

## 2.11 TRANSDUCERS

### 2.11.1 WINDOW GLASS TRANSDUCERS

Provide piezo type window mounted glass transducers as manufactured by Atlas-Soundolier or approved equal, for resonting.

### 2.11.2 DUCT TRANSDUCERS

Provide piezo type duct mounted transducers for sound masking resontion. The transducers shall provide a minimum of 85 dB sound pressure level and mounted inside/to mechancial ductwork.

## 2.7 LOUDSPEAKERS

### 2.12 Cone Speaker

The cone speaker shall as a minimum conform to the following specifications:

Minimum Axial Sensitivity: 45 dB.  
 Size: 8 inches with 1-inch (25-mm) voice coil  
 Dispersion Angle: 100 degrees.

Application: Ceiling or Pendant  
 Frequency range: 60 to 12,000 Hz  
 Power Rating: Normal - 10 watts

Voice Coil Impedance: 8 ohms  
 Line Matching  
 Transformer Type: 25/70 volt line  
 Capacity: 2 watts

Magnet:	8 ounces or greater
Primary Taps:	0.5, 1, and 2 watts
Primary Impedance:	25 volts - 1250, 625, and 312 ohms 70 volts - 10k, 5k, and 2.5k ohms
Frequency Response:	30 - 20,000 Hz
Insertion Loss:	Less than 1 dB

### 2.13 SPEAKER ENCLOSURES

Provide speakers mounted in ceiling mounted backcans, flush in ceiling with baffle and trim or mount pendant mounted above ceiling as specified, in backcan, baffle and trim.

### 2.14 SWITCHES AND CONTROLS

#### 2.14.1 REMOTE TRANSDUCER CONTROLS

Provide remote volume controls with detented 3 dB steps and an OFF position. Provide with VU meter. The controls shall be rack and gang mounted and labelled respective to the transducer controlled. Insertion loss of the controls shall not exceed 0.6 dB and the power-handling capacities of the control shall be 10 watts. Low-voltage priority override relays shall be furnished as part of these controls with all wiring to the racks to allow override of the volume controls for priority announcements.

#### 2.14.2 REMOTE LOUDSPEAKER VOLUME CONTROLS

Provide remote volume controls shall be an auto transformer type with detented 3 dB steps and an OFF position. Provide with VU meter. The controls shall be rack and gang mounted and labelled respective to the speaker controlled. Insertion loss of the controls shall not exceed 0.6 dB and the power-handling capacities of the control shall be 10 watts. Low-voltage priority override relays shall be furnished as part of these controls with all wiring to the racks to allow override of the volume controls for priority announcements.

### 2.15 EQUIPMENT CABINETS

Cabinets, freestanding modular type, 16 gauge steel construction treated to resist corrosion. Cabinet shall have removable and lockable side panels, front and rear doors, and have adjustable feet for leveling. Cabinet shall be vented in the roof and rear door. Cabinet shall have cable access in the roof and base and be compatible with 19 inch panel mounting. Provide cabinet with grounding bar, rack mounted 550 CFM fan with filter and a surge protected power strip with 6 duplex 20 amp receptacles.

### 2.16 SPEAKER AND TRANSDUCER CABLE

Cables shall be of the gauge required depending upon the cable run length. In no case shall any cable be used which is smaller than 20 AWG. Insulation on the conductors shall be polyvinyl chloride (PVC) or an equivalent synthetic thermoplastic not less than 0.009 inch. Cables shall be shielded with a 34-gauge tinned soft copper strand formed into a braid. Cables shall be jacketed with a Fluoropolymer compound. The jacket thickness shall be 0.0200 inch minimum.

## 2.17 LAPTOP TUNER

The contractor shall provide a complete portable "laptop" type computer/tuner to tune and equalize the system. Provide all required software and license to the Contracting Officer.

## PART 3 EXECUTION

### 3.1 INSTALLATION

All equipment shall be installed as indicated and specified, and in accordance with the manufacturer's recommendations and in accordance with Defense Intelligence Agency and Langley Air Force Base Security requirements. All electronic components shall be rack mounted type. Volume controls shall be ganged, labelled and rack mounted in the rack with the electronic components. Equipment mounted out-of-doors or subject to inclement conditions shall be weatherproofed.

#### 3.1.1 Speaker Assemblies

Above ceiling speakers: Suspend with chains from building structure above ceilings so bottom of assembly is 6 to 8 inches above upper plane of finished ceiling material. Ceiling mounted speakers: Flush mount in drop ceiling complete with trim, backcan and accessories. Use eyebolts on speaker assemblies for attachment. Suspend independently of supports for components of other building systems.

#### 3.1.2 Speaker Connections

For two- or three-channel systems, connect speaker assemblies alternatively so masking sound is redundant throughout zones of coverage.

#### 3.1.3 Impedance Matching

Impedance Matching: For system components, including connecting cable, provide end-to-end level and impedance-matched signal paths. Use matching networks and balancing devices at connections where necessary to avoid mismatches.

#### 3.1.4 Equipment Cabinets

Cabinets, freestanding modular type. When cabinets are connected together, remove adjoining side panels for cable routing between cabinets. Cabinets, wall-mounted modular type. Mount cabinet so height of highest panel does not exceed 78 inches above floor.

#### 3.1.5 Wiring

Wiring shall be installed in rigid steel conduit, intermediate metal conduit, cable trays, or electric metallic tubing as specified in Section 16415 ELECTRICAL WORK, INTERIOR. Wiring for grounding, line level, speaker, transducers and power cables shall be isolated from each other by physical isolation and metallic shielding. Shielding shall be terminated at only one end.

### 3.2 GROUNDING

All grounding practices shall comply with NFPA 70. Equipment shall be

grounded to the serving panelboard ground bus through a green grounding conductor. Metallic conduits serving the equipment shall be isolated on the equipment end with an insulating bushing to prevent noise from being transferred to the circuit. Equipment racks shall be grounded to the panelboard ground bus utilizing a #8 conductor. Grounding conductor shall be terminated to the rack using connector suitable for that purpose.

### 3.3 Field Testing, Installation and Report

The contractor shall field test and report and make all necessary adjustments to the system, to provide a complete sound masking system. Provide written reports of all test and adjustments to the Contracting Officer. Include the following as a minimum:

1. Operational Test: Start system to confirm proper operation. Remove malfunctioning units, re-place with new units, and retest. Make initial sound spectrum and sound level adjustments for each zone.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
4. Pretesting: Tune, align, and adjust system and pretest components, wiring, and functions to verify they comply with specified material, installation, and performance requirements. Correct deficiencies and retest until satisfactory performance and conditions are achieved.
5. Masking Sound-Power-Level Adjustments: Adjust independently for each space to minimum level between 40 and 50 dB that will provide speech privacy between adjacent workstations while complying with other system requirements.

### 3.4 ACCEPTANCE TESTS

After installation has been completed, the Contractor shall conduct acceptance tests, utilizing the approved test procedures, to demonstrate that equipment operates in accordance with specification requirements. The Contractor shall notify the Contracting Officer 15 days prior to the performance of tests. In no case shall notice be given until after the Contractor has received written Contracting Officer approval of the test plans as specified. The acceptance tests shall include originating and receiving messages at specified stations, at proper volume levels, without cross talk or noise from other links or nondesignated units. Schedule tests after pretesting has been successfully completed. Include the following:

1. Perform tests as specified below, as required by ASTM E 1041, and as required to verify performance specified in "System Description" Article in this Section.
2. Instrumentation: Use a professional-quality, sound-level meter with octave-band filters and documentation of recent calibration against recognized standards.
3. Record test observations, readings, and corrective actions.
4. System Tests: Include the following for each system zone:

- a. Transducer Circuit Impedance Test: Measure impedance at 1 kHz with amplifier disconnected, using a professional impedance meter or bridge. Locate and correct faults denoted by abnormal readings.
- b. Ambient Sound-Level Tests: With system off, measure ambient sound level in one-third octave bands. Also measure ambient sound level as a single, wide-band, A-weighted reading.
- c. Amplifier Noise Test: Check for performance specified in "System Description" Article with masking noise generator off and amplifiers on.
- d. System Noise Test: With masking noise signal on and amplifiers adjusted at a working level 10 dB above ambient sound level, check for hum, buzz, rattle, or other operating deficiencies.
- e. Spatial Uniformity Test: Measure sound level at locations no greater than 15 feet (4.6 m) o.c. throughout covered spaces to determine compliance with specified performance level.
- f. Frequency Response Adjustment and Test: Adjust one-third octave frequency bands and other unit filters to provide response. Coordinate with NC 40 contour defined below between 200 and 2000 Hz, with smooth natural roll-off from those frequencies.

RELATIVE SOUND-POWER LEVEL - dB		
BAND	OPEN PLAN AREAS	ENCLOSED OFFICES
200	Plus 4	Minus 2
250	Plus 3	Minus 2
315	Plus 2	Minus 2.5
400	Plus 1	Minus 3
500	0	Minus 4
630	Minus 1	Minus 5
800	Minus 2	Minus 6
1000	Minus 3	Minus 7
1250	Minus 4	Minus 8.5
1600	Minus 5	Minus 10
2000	Minus 6	Minus 12

5. Adjust level of masking sound for each space so one-third octave band centered at 500 Hz has final selected sound-power level for that space. Measure deviation from listed values in one-third octave bands from 400 to 2000 Hz. Measured values must not deviate from those listed by more than 4 dB for open plan areas and 8 dB for enclosed offices. The total of individual band deviations in eight bands must not exceed 16 dB for open plan areas and 30 dB for enclosed offices.

6. Walk-through Test: Transducers shall be low profile and blend in with the decor.

7. Temporal Stability Test: Check for uniformity of time by measuring sound level in each of 14 octave bands at one-minute intervals over a 30-minute test period. Deviations must not exceed limits specified in "System Description" Article in Part 2.

E. Retest: Correct deficiencies identified by tests and observations and retest until meeting specified requirements.

F. Recording Control Settings and System Adjustments: Record final control

settings and programming, and final tap setting of transducer and speaker matching transformers. Record final sound-level measurements and observations.

#### ADJUSTMENTS

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose without additional cost.

### 3.5 TRAINING

The Contractor shall conduct a training course for 4 members of the operating and maintenance staff as designated by the Contracting Officer. The training course will be given at the installation during normal working hours for a total of 4 hours and shall start after the system is functionally complete but prior to final acceptance tests. The field instructions shall cover all of the items contained in the approved operating and maintenance manuals, as well as demonstrations of routine maintenance operations. The Contracting Officer shall be notified at least 14 days prior to the start of the training course.

-- End of Section --

## SECTION 16770

## PUBLIC ADDRESS SYSTEMS

04/02

## 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.

## ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

EIA ANSI/EIA-310-D (1992) Cabinets, Racks, Panels, and  
Associated Equipment

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

## 1.2 SYSTEM DESCRIPTION

The radio and public address system shall consist of an audio distribution network to include amplifiers, mixers, microphones, speakers, cabling, and ancillary components required to meet the required system configuration and operation. Provide a PA cabinet with a smoked glass front cabinet, type same as the LAN cabinets. See details on the drawings and in communications specifications. Mount controls, preamplifier mixer, power amplifier, AM/FM tuner, compact disc recorder/player, cassette recorder/player, etc., in the PA cabinet. IMPORTANT NOTE: The public address system shall be a one way type for the SCI area of this facility.

## 1.2.1 Multi-Channel System with Paging

The system shall include microphones, microphone outlet receptacles, microphone inputs with preamplifiers, inputs for compact disc, magnetic tape, telephone, and program sources, single channel paging, control for each input, power amplifying equipment, and accessories required to output the public address and paging audio signals through selected portions of the audio distribution network as indicated. The paging signal shall replace by zones all channels of the radio system output, when the paging function is activated.

## 1.2.2 Single-Channel System

The system shall control and amplify an audio program for distribution within the areas indicated. Components of the system shall include a mixer-preamplifier, mixer-amplifier, mike input expander, power amplifier, microphone, speaker system, compact disc, cassette player, AM-FM tuner, cabling and other associated hardware.

## 1.2.3 System Performance

The system shall provide even sound distribution throughout the designated area, plus or minus 3 dB for the 1/1 octave band centered at 4000 Hz. The

system shall provide uniform frequency response throughout the designated area, plus or minus 3 dB as measured with 1/3-octave bands of pink noise at locations across the designated area selected by the Contracting Officer. The system shall be capable of delivering 75 dB average program level with additional 10 dB peaking margin sound pressure level (SPL) in the area at an acoustic distortion level below 5 percent total harmonic distortion (THD). Unless otherwise specified the sound pressure reference level is 20 micro Pascal (0.00002 Newtons per square meter).

### 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-02 Shop Drawings

Radio and Public Address System; G,AE.

Detail drawings consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Note that the contract drawings show layouts based on typical speakers. The Contractor shall check the layout based on the actual speakers to be installed and make necessary revisions in the detail drawings. Detail drawings shall also contain complete point to point wiring, schematic diagrams and other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

#### SD-03 Product Data

Spare Parts;

Spare parts data for each different item of material and equipment specified, after approval of the detail drawings and not later than 2 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

#### SD-06 Test Reports

Approved Test Procedures; G, AO.

Test plan and test procedures for the acceptance tests. The test plan and test procedures shall explain in detail, step-by-step actions and expected results to demonstrate compliance with the requirements specified. The procedure shall also explain methods for simulating the necessary conditions of operation to demonstrate system performance.

Acceptance Tests; G, AO.

Test reports in booklet form showing all field tests performed to adjust each component and to prove compliance with the specified performance criteria, upon completion and testing of the installed system. The reports shall include the manufacturer, model number, and serial number of test equipment used in each test. Each report shall indicate the final position of controls and operating mode of the system.

#### SD-07 Certificates

Components; G, AE.

Copies of current approvals or listings issued by UL, or other nationally recognized testing laboratory for all components.

#### SD-10 Operation and Maintenance Data

Radio and Public Address System, Data Package 3; G, AO.

Submit data package in accordance with Section 01781, OPERATION AND MAINTENANCE DATA

### 1.4 DELIVERY AND STORAGE

Equipment placed in storage until installation shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, and other contaminants.

### 1.5 VERIFICATION OF DIMENSIONS

The Contractor shall become familiar with the details of the work and working conditions, shall verify dimensions in the field, and shall advise the Contracting Officer of any discrepancies before performing the work.

## PART 2 PRODUCTS

### 2.1 STANDARD PRODUCTS

Material and equipment to be provided shall be the standard products of a manufacturer regularly engaged in the manufacture of such products, and shall essentially duplicate material and equipment that have been in satisfactory use at least 2 years. All components used in the system shall be commercial designs that comply with the requirements specified. Equipment shall be supported by a service organization that is within 20 miles of the site.

#### 2.1.1 Identical Items

Items of the same classification shall be identical. This requirement includes equipment, modules, assemblies, parts, and components.

#### 2.1.2 Nameplates

Each major component of equipment shall have the manufacturer's name, address, model and catalog number, and serial number on a plate secured to the equipment.

### 2.2 MIXER-PREAMPLIFIER

Mixer-preamplifier shall as a minimum conform to the following specifications:

Rated Output:	18 dB
Frequency Response:	Plus or Minus 1 dB, 20 - 20,000 Hz
Distortion:	Less than 0.5 percent, 20 - 20,000 Hz
Signal to noise:	Microphone - 60 dB Aux - 70 dB
Inputs:	5 independent balanced low- impedance transformer-isolated
Input Sensitivity:	Microphone - 0.003 volts Aux - 0.125 volts Magnetic Cartridge - 0.0005 volts
Input Channel Isolation:	80 dB minimum
Tone Controls:	Plus or Minus 10 dB range at 50 and 15,000 Hz
Power Requirement:	110-125 Vac 60 Hz

### 2.3 POWER AMPLIFIERS

Power amplifiers as a minimum conform to the following specifications:

Rated power output:	400 watts RMS
Frequency Response:	Plus or Minus 3 dB, 20-20,000 Hz
Distortion:	Less than 2 percent at RPO, 600-13,000 Hz
Input Impedance:	50 k ohm unbalanced
Output Impedance:	Balanced 4 and 8 ohms
Output voltage:	25 and 70.7 volts
Power Requirement:	110-125 Vac 60 Hz

### 2.4 MICROPHONE INPUT MODULES

Microphone input modules shall as a minimum conform to the following specifications:

Rated Outputs:	0.25 volts into 10,000 ohms 1.0 volts into 10,000 ohms
Frequency Response:	Plus or Minus 2 dB, 20 - 20,000 Hz
Distortion:	Less than 0.5 percent 20 - 20,000 Hz

Inputs: 4 transformer - coupled balanced 150 ohm  
Input Sensitivity: 0.003 volts  
Input Channel  
Isolation: 70 dB minimum

## 2.5 MICROPHONES

### 2.5.1 Desk Microphone

Microphones shall as a minimum conform to the following specifications:

Element: Dynamic  
Pattern: Cardioid  
Frequency Response: 50 - 12,000 Hz  
Impedance: Low impedance mic (150-400 ohms)  
Front-to-back Ratio: 20 dB  
Selector switches: Selector switches for zone shall be  
be Separate  
console adjacent to microphone

### 2.5.2 Microphone Jack

Each outlet for microphones shall consist of a standard outlet box, flush-mounted, and fitted with a three-pole, polarized, locking-type, female microphone jack and a corrosion resistant-steel device plate.

## 2.6 LOUDSPEAKERS

### 2.6.1 Cone Speaker

The cone speaker shall as a minimum conform to the following specifications:

Application: Ceiling  
Frequency range: 60 to 12,000 Hz  
Power Rating: Normal - 7 watts  
Peak - 10 watts  
Voice Coil Impedance: 8 ohms  
Line Matching  
Transformer Type: 25/ 70.7 volt line  
Capacity: 4 watts  
Magnet: 10 ounces or greater

Primary Taps:	0.5, 1, 2 and 4 watts
Primary Impedance:	25 volts - 1250, 625, and 312 ohms 70.7 volts - 10k, 5k, and 2.5k ohms
Frequency Response:	30 - 20,000 Hz
Insertion Loss:	Less than 1 dB

### 2.6.2 Ceiling Speaker Enclosures

Ceiling speaker enclosure shall be constructed of heavy gauge cold steel with interior undercoating and 1 1/2 inch thick high density fiberglass 1-1/2 lbs per cu. ft. The unit shall be round and designed for recessed installations which will be accomplished via standard screw torsion spring flange mount mounting. Recessed models shall have a rust-preventive, textured white coating and the surface mount unit finished in textured white. Enclosure shall include four triple compound conduit knockouts.

## 2.7 SPEAKER SWITCHING PANEL

### 2.7.1 Selector Switches

Zone control shall be provided for the paging function. The speaker switching panel shall contain at double-pole, push button selector switches and shall be rack-mounted to activate priority relays. Selector switches labeling shall be provided to identify the zones.

### 2.7.2 System Power supply

Power supply shall be provided for priority relays and controls, rack-mounted and sized for a capacity equal to 200 percent of the as-built control system, and shall operate at 24 Vdc. Input and output shall be protected to permit Class 2 wiring in accordance with NFPA 70.

## 2.8 AM/FM EQUIPMENT

### 2.8.1 AM/FM Tuner

AM/FM tuner shall be rack-mounted and shall as a minimum conform to the following characteristics:

Tuning Range:	AM - 540 to 1605 kHz FM - 88 to 108 MHz
Selectivity:	60 dB on FM 40 dB on AM
Sensitivity:	FM - 1.5 microvolts AM - 2.0 microvolts
Capture Ratio:	1.0 dB
Readout/selection:	Digital
Other features:	Phased Lock Loop (PLL)
Power Requirement:	110-125 Vac, 60Hz

### 2.8.2 AM/FM Antenna

The AM/FM antenna shall be roof-mounted, either combined and suitable for both AM and FM reception or separate AM and FM antennas and shall cover all frequency bands specified for radio tuners. The antenna system shall be coordinated with the TV system and other systems with antenna communication. The system shall be furnished complete with a transformer, insulators, crossover insulator, cable of proper length, lightning arresters, coupling transformer and divider network at the radio tuners.

## 2.9 COMPACT DISC PLAYER

Player shall have three beam laser pickup, dual Digital-to-Analog converters, random access and random mode programmable playback. Player shall have capability to play a minimum of 5 discs automatically. Player shall as a minimum conform to the following:

Frequency:	10 - 20,000 Hz Plus or Minus 1 dB
Signal-to-Noise:	Minimum of 100 dB
Dynamic Range:	Minimum of 96 dB
Total Harmonic Distortion:	Maximum of 0.005% at 1 KHZ
Channel Separation:	Minimum 100 dB at 1 KHZ
Quantization:	Minimum of 18 Bits Linear per channel
Conversion Rate:	Minimum 8 x Oversampling
Disc Size:	5 inch
Power Requirement:	110-125 Vac, 60Hz

## 2.10 CASSETTE TAPE EQUIPMENT

The cassette tape play deck shall as a minimum conform to the following specifications:

Frequency Response:	Plus or minus 3 dB, 20 - 20,000 Hz
Wow and Flutter:	Less than 0.09 percent WRMS
Signal-to-Noise:	74 dB
Noise Reduction system:	Dolby B
Play Head:	Hard Parmalloy
Operation:	Automatic Reverse
Power Requirement:	110-125 Vac, 60 Hz

## 2.11 PRIORITY RELAYS AND CONTROLS

Priority relays and controls required to accomplish operations specified shall be provided. Relays shall be completely enclosed with a plastic dust cover for maximum protection against foreign matter, and shall be plug-in

type. Relays shall be provided with a diode wired across the relay coil for transient suppression and shall be installed utilizing factory-prewired, rack-mounted receptacle strips. Coil shall be maximum 24 volts dc.

## 2.12 SWITCHES AND CONTROLS

### 2.12.1 Radio System Control Switch

The loudspeaker in each room, or group of speakers in a room, shall be provided with a flush program channel selector rotating-switch knob. The switch shall be mounted at location and height above the floor and in accordance with Section 16415A ELECTRICAL WORK, INTERIOR . A volume control shall be installed with a switch at each station and shall be of the auto transformer type and set so that the maximum volume is sufficient for the area while not disturbing adjacent areas. If music is turned down or off, the paging signal shall override controls except speakers designated for music only. Each device plate shall be satin-finished, corrosion-resisting steel permanently marked to indicate the channel selected.

### 2.12.2 Remote Loudspeaker ON/OFF Switches

Remote switches shall be toggle switch 2-pole, wall-mounted, single gang type with engraved switch plates finished to match the approved finish of electrical wall switches. Low-voltage priority override relays shall be provided as part of the switches with all wiring to the racks to allow override of the ON/OFF switches for priority announcements.

### 2.12.3 Remote Loudspeaker Volume Controls

Remote volume controls shall be an auto transformer type with detented 3 dB steps and an OFF position. The controls shall be wall-mounted in single-gang outlet boxes and furnished with engraved switching plates finished to match approved finish of electrical wall switches. Insertion loss of the controls shall not exceed 0.6 dB and the power-handling capacities of the control shall be 75 watts. Low-voltage priority override relays shall be furnished as part of these controls with all wiring to the racks to allow override of the volume controls for priority announcements.

## 2.13 EQUIPMENT RACKS

Equipment shall be mounted on 19 inch racks in accordance with EIA ANSI/EIA-310-D and located as shown on drawings. Ventilated rear panels, solid side panels, and solid top panels shall be provided. Equipment racks shall be provided with lockable front panels that limit access to equipment. The lockable front shall not cover items that require operator access such as am/fm tuner, CD player, or tape player. Rack cooling shall be through perforations or louvers in front panels to ensure adequate ventilation of equipment and top rack mounted fan. The racks and panels shall be factory finished with a uniform baked enamel over rust inhibiting primer.

## 2.14 CABLES

### 2.14.1 Speaker Cable

Cables shall be of the gauge required depending upon the cable run length. In no case shall cable be used which is smaller than 18 AWG. Insulation on

the conductors shall be polyvinyl chloride (PVC) or an equivalent synthetic thermoplastic not less than 0.009 inch. Cables shall be jacketed with a Fluoropolymer compound. The jacket thickness shall be 0.02 inch minimum.

#### 2.14.2 Microphone Cable

Cable conductor shall be stranded copper 20 AWG. Insulation on the conductors shall be polyvinyl chloride (PVC) or an equivalent synthetic thermoplastic not less than 0.009 inch. Cable shall be shielded 100% of aluminum polyester foil with a bare 22 gauge stranded soft copper drain conductor. Cables shall be jacketed with a Fluoropolymer compound. The jacket thickness shall be 0.02 inch minimum.

#### 2.14.3 Antenna Cable

Antenna coaxial cable shall have 75 ohm plus or minus 2 ohm. Attenuation of the coaxial cable span between the antenna and amplifier shall not exceed 2.5 dB at 108 MHz.

#### 2.15 TERMINALS

Terminals shall be solderless, tool-crimped pressure type.

#### 2.16 SURGE PROTECTION

##### 2.16.1 Power Line Surge Protection

Major components of the system such as power amplifiers, mixer-preamplifiers, and tuners, shall have a device, whether internal or external, which provides protection against voltage spikes and current surges originating from commercial power sources per IEEE C62.41 B3 combination waveform and NFPA 70. Fuses shall not be used for surge protection. The surge protector shall be rated for a maximum let thru voltage of 350 Volts ac (line-to-neutral) and 350 Volt ac (neutral-to-ground). Surge protection device shall be UL listed and labeled as having been tested in accordance with UL 1449.

##### 2.16.2 SIGNAL SURGE PROTECTION

Major components of the system shall have internal protection circuits which protects the component from mismatched loads, direct current, and shorted output lines. Communication cables/conductors shall have surge protection installed at each point where it exits or enters a building.

#### 2.17 TELEPHONE INTERFACE MODULE

Telephone Interface module shall provide one way all call paging access from telephone to PA system. Paging shall be accomplished by the building telephone system instruments interconnected to the PA system via an interface module to allow telephone dial up access to the paging amplifier.

Interface module shall produce an alert tone in the associated speakers on activation. Telephone interface module shall as a minimum conform to the following specifications:

Impedance:	600 ohms
Frequency response:	100Hz to 10Khz
70V Input Impedance:	200K ohms
Output level:	400mV rms

Input Power Requirement: 12-24Vdc (from power supply)  
Access requirement: Electronic (analog) or IA2 line key (line card required) PABX loop or ground-start trunk port, or dedicated single-line phone.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Equipment shall be installed as indicated and specified, and in accordance with the manufacturer's recommendations except where otherwise indicated. Equipment mounted out-of-doors or subject to inclement conditions shall be weatherproofed. The antenna shall be supported at least 60 inch clear above the roof by means of self-supported or guyed mast.

##### 3.1.1 Equipment Racks

Racks shall be mounted side-by-side and bolted together. Items of the same function shall be grouped together, either vertically or side-by-side. Controls shall be symmetrically arranged in the PA Cabinet. The PA cabinet shall be a smoked glass front cabinet type same as the LAN cabinets. See details on the drawings and in communications specifications.. Mount controls, preamplifier mixer, power amplifier, AM/FM tuner, compact disc recorder/player, cassette recorder/player, etc., in the PA cabinet. Audio input and interconnections shall be made with approved shielded cable and plug connectors; output connections may be screw terminal type. All connections to power supplies shall utilize standard male plug and female receptacle connectors with the female receptacle being the source side of the connection. Inputs, outputs, interconnections, test points, and relays shall be accessible at the rear of the equipment rack for maintenance and testing. Each item shall be removable from the rack without disturbing other items or connections. Empty space in equipment racks shall be covered by blank panels so that the entire front of the rack is occupied by panels.

##### 3.1.2 Wiring

Wiring shall be installed in rigid steel conduit, intermediate metal conduit, cable trays, or electric metallic tubing as specified in Section 16415A ELECTRICAL WORK, INTERIOR. Wiring for microphone, grounding, line level, speaker and power cables shall be isolated from each other by physical isolation and metallic shielding. Shielding shall be terminated at only one end.

#### 3.2 GROUNDING

All grounding practices shall comply with NFPA 70. The antenna mast shall be separately grounded. Equipment shall be grounded to the serving panelboard ground bus through a green grounding conductor. Metallic conduits serving the equipment shall be isolated on the equipment end with an insulating bushing to prevent noise from being transferred to the circuit. Equipment racks shall be grounded to the panelboard ground bus utilizing a #8 conductor. Grounding conductor shall be terminated to the rack using connector suitable for that purpose.

#### 3.3 ACCEPTANCE TESTS

After installation has been completed, the Contractor shall conduct acceptance tests, utilizing the approved test procedures, to demonstrate

that equipment operates in accordance with specification requirements. The Contractor shall notify the Contracting Officer 14 days prior to the performance of tests. In no case shall notice be given until after the Contractor has received written Contracting Officer approval of the test plans as specified. The acceptance tests shall include originating and receiving messages at specified stations, at proper volume levels, without cross talk or noise from other links or nondesignated units.

#### 3.4 TRAINING

The Contractor shall conduct a training course for 4 members of the operating and maintenance staff as designated by the Contracting Officer. The training course will be given at the installation during normal working hours for a total of 4 hours and shall start after the system is functionally complete but prior to final acceptance tests. The field instructions shall cover all of the items contained in the approved operating and maintenance manuals, as well as demonstrations of routine maintenance operations. The Contracting Officer shall be notified at least 14 days prior to the start of the training course.

-- End of Section --

RMS SUBMITTAL REGISTER INPUT FORM			CONTRACT NUMBER		DELIVERY ORDER														
OPERATIONS SUPPORT CENTER, LANGLEY AFB, VA																			
SECTION	PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL								CLASSIFICATION		REVIEWING OFFICE						
			01 - PRECON SUBMITTALS	02 - SHOP DRAWINGS	03 - PRODUCT DATA	04 - SAMPLES	05 - DESIGN DATA	06 - TEST REPORTS	07 - CERTIFICATES	08 - MFRS INSTRUCTIONS	09 - MFRS FIELD REPORT	10 - O&M DATA	11 - CLOSEOUT SUBMITTALS	FOR INFORMATION ONLY	GOVERNMENT APPROVED	DO - DISTRICT OFFICE	AO - AREA OFFICE	RO - RESIDENT OFFICE	PO - PROJECT OFFICE
16710	1.5	SUBMITTALS																	X
	1.5.1	SPARE PARTS LISTS			6							X							
	1.5.2	PREMISES DISTRIBUTION SYSTEM DRAWINGS			6								X						X
	1.5.3	RECORD KEEPING DOCUMENTATION											X						X
	1.5.3.1	CABLES			6								X						X
	1.5.3.2	TERMINATION HARDWARE			6								X						X
																			X
	1.5.4	MANUFACTURER'S RECOMMENDATIONS							6				X						X
	1.5.5	TEST PLAN							6				X						X
	1.5.6	QUALIFICATIONS							6				X						X
	1.5.7	TEST REPORT							6				X						X
	1.5.8	CERTIFICATION							6				X						X
	1.5.8.1	PREMISES DISTRIBUTION SYSTEM							6				X						X
	1.5.8.2	MATERIALS AND EQUIPMENT							6				X						X
	1.7	OPERATIONS AND MAINTENANCE MANUAL									6		X						X
16175	1.4	SUBMITTALS											X						X
	1.4	Shop Drawings			6								X						X
	1.4	SD-01 DATA																	X
	1.4	Manufacturer Catalog Data			6								X						X
	1.4	Storage Batteries			6								X						X
	1.4	Voltage Drop			6								X						X
	1.4	Spare Parts			6							X							X
	1.4	SD-04 RECORD DRAWINGS																	X
	1.4	Record Drawing Software			6								X						X
	1.4	SD-08 STATEMENTS																	X
	1.4	Testing							6				X						X
	1.4	SD-09 REPORTS																	X
	1.4	Testing							6				X						X
	1.4	SD-13 CERTIFICATES																	X
	1.4	Equipment							6				X						X
	1.4	Qualifications							6				X						X
	1.4	SD-19 OPERATION and MAINTENANCE MANUALS									6		X						X

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		01111	SD-07 Certificates														
			Safety and Health Plan	1.4	G												
			Designated first-aid and CPR trained attendants	1.5.1.9	G												
		01320	SD-01 Preconstruction Submittals														
			Initial Project Schedule	3.6.2	G												
			Preliminary Project Schedule	3.6.1	G												
			Periodic Schedule Updates	3.6.3	G												
			SD-07 Certificates														
			Qualifications	1.3													
			SD-09 Manufacturer's Field Reports														
			Narrative Report	3.7.2													
			Schedule Reports	3.7.4													
		01356A	SD-07 Certificates														
			Mill Certificate or Affidavit	2.1.3													
		01560	SD-03 Product Data														
			Preconstruction Survey		G												
			Environmental Protection Plan		G												
			Erosion Control Plan		G												
		01780A	SD-02 Shop Drawings														
			As-Built Drawings	1.2.1	G												
			SD-03 Product Data														
			As-Built Record of Equipment and Materials	1.2.2	G												
			Warranty Management Plan	1.3.1	G												

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		01780A	Warranty Tags	1.3.5	G												
			Final Cleaning	1.6	G												
		02115A	SD-03 Product Data														
			Work Plan	1.5.2	G												
			Qualifications	1.3	G												
			Salvage Rights	3.12.4	G FIO												
			SD-06 Test Reports														
			Backfill Material	2.1	G												
			Tank Contents Verification	3.2	G												
			Contaminated Water Disposal	3.5.2	G												
			Soil Examination, Testing, and Analysis	3.10	G												
			Backfilling	3.11	G												
			Tank Closure Report	3.14	G												
		02220	SD-03 Product Data														
			Work Plan														
			SD-07 Certificates														
			Demolition plan	1.9	G												
			Notifications	1.4.1	G												
		02300A	SD-03 Product Data														
			Earthwork														
			SD-06 Test Reports														
			Testing	3.11													
			SD-07 Certificates														
			Testing	3.11													
		02315A	SD-06 Test Reports														

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		02315A	Testing	3.14													
		02316A	SD-06 Test Reports														
			Field Density Tests	3.4.3													
			Testing of Backfill Materials	3.4.2													
		02364A	SD-03 Product Data														
			Application	1.3	G												
			Termiticides	2.1	G												
			Foundation Exterior	3.2.3													
			Utilities and Vents	3.2.4													
			Crawl and Plenum Air Spaces	3.2.5													
			Verification of Measurement	3.5													
			Application Equipment	3.4.1													
			SD-04 Samples														
			Termiticides	2.1													
			SD-06 Test Reports														
			Equipment Calibration and Tank Measurement	3.4.1													
			Soil Moisture	3.3.1													
			SD-07 Certificates														
			Qualifications	1.2													
		02510A	SD-03 Product Data														
			Installation	3.1													
			SD-06 Test Reports														
			Bacteriological Disinfection														
			SD-07 Certificates														
			Installation	3.1													

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		02531	SD-02 Shop Drawings														
			Precast concrete manhole		G FIO												
			Metal items	2.3.3	G FIO												
			Frames, covers, and gratings	2.3.3.1	G FIO												
			SD-03 Product Data														
			Pipeline materials	2.1	G FIO												
			SD-07 Certificates														
			Portland Cement		G FIO												
		02555	SD-02 Shop Drawings														
			Distribution System	3.4.9	G AE												
			SD-03 Product Data														
			Distribution System	3.4.9	G AE												
			SD-07 Certificates														
			Distribution System	3.4.9	G AE												
			Welding	1.6	G AE												
			SD-10 Operation and Maintenance Data														
			Distribution System	3.4.9	G RE												
		02630A	SD-03 Product Data														
			Placing Pipe	3.3													
			SD-04 Samples														
			Pipe for Culverts and Storm Drains	2.1													
			SD-07 Certificates														
			Resin Certification	2.1.2													
			Pipeline Testing	3.8													

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		02630A	Determination of Density	3.7.5													
			Frame and Cover for Gratings	2.3.6													
		02741N	SD-05 Design Data														
			Job-mix formula	1.3.2													
			SD-07 Certificates														
			Stone Base Course	2.1.2													
			Paint	2.1.4													
		02763A	SD-03 Product Data														
			Paint														
		02770A	SD-03 Product Data														
			Concrete	2.1													
			SD-06 Test Reports														
			Field Quality Control	3.8													
		02780	SD-04 Samples														
			Concrete Paving Block	2.1.2	G A/E												
		02821A	SD-07 Certificates														
			Chain Link Fence	2.1.1													
		02840A	SD-02 Shop Drawings														
			Installation	3.1	G AE												
			SD-03 Product Data														
			Vehicle Barriers		G AE												
			Spare Parts	1.6	G												
			SD-06 Test Reports														
			Field Testing	3.4	G AE												
			SD-10 Operation and Maintenance Data														

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		02840A	Vehicle Barriers		G AE												
			Operating and Maintenance Instructions	3.5	G AE												
		02921A	SD-03 Product Data														
			Surface Erosion Control Material	2.6													
			Chemical Treatment Material	1.4.3													
			Delivery Schedule														
			SD-06 Test Reports														
			Equipment Calibration	3.1.3													
			Soil Test	3.1.4													
			SD-07 Certificates														
			Seed	2.1													
			Topsoil	2.2													
			pH Adjuster	2.3.1													
			Fertilizer	2.3.2													
			Organic Material	2.3.4													
			Soil Conditioner	2.3.5													
			Pesticide	2.5													
			Maintenance Record	3.8.3.5													
		02930A	SD-03 Product Data														
			Plant Establishment Period	3.8													
			SD-04 Samples														
			Delivered Topsoil	1.4.1.3													
			Soil Amendments	3.1.4.2													
			Mulch	2.4													
			SD-06 Test Reports														

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		02930A	Soil Test	3.1.4.2													
			SD-07 Certificates														
			Plant Material	2.1													
			Topsoil	2.2													
			pH Adjuster	2.3.1													
			Fertilizer	2.3.2													
			Organic Material	2.3.3													
			Soil Conditioner														
			Organic Mulch	2.4.1													
			Pesticide	2.10													
			Delivery Schedule														
		02935A	SD-03 Product Data														
			Chemical Treatment Material	1.3.3													
			Work Plan and Schedule														
			Application of Pesticide	3.5													
			SD-06 Test Reports														
			Soil Tests	3.1													
			SD-07 Certificates														
			pH Adjuster	2.1.1													
			Fertilizer	2.1.2													
			Mulch	2.2													
			Pesticide	2.4													
		02981	SD-01 Preconstruction Submittals														
			Design Analysis, Calculations, and Spare Parts		G AE												
			SD-02 Shop Drawings														

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		02981	Shop Drawings		G AE												
			SD-10 Operation and Maintenance Data														
			Record and As-Built Drawings														
		03101A	SD-03 Product Data														
			Materials	2.1													
			SD-06 Test Reports														
			Inspection	3.3													
			Formwork Not Supporting Weight of Concrete	3.2.1													
		03150A	SD-02 Shop Drawings														
			Waterstops	2.4													
			SD-03 Product Data														
			Preformed Expansion Joint Filler	2.2													
			Sealant	2.3													
			Waterstops	2.4													
			SD-07 Certificates														
			Preformed Expansion Joint Filler	2.2													
			Sealant	2.3													
			Waterstops	2.4													
		03200A	SD-02 Shop Drawings														
			Reinforcement	3.1	G												
			SD-07 Certificates														
			Reinforcing Steel	2.3													
		03300	SD-03 Product Data														
			Mixture Proportions	1.7													

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		03300	SD-06 Test Reports														
			Testing and Inspection for Contractor Quality Control	3.14													
			SD-07 Certificates														
			Qualifications	1.4													
		03413A	SD-02 Shop Drawings														
			Architectural Concrete	2.2.1	G AE												
			SD-03 Product Data														
			Calculations	1.4.5	G AE												
			Mix Design	2.1.9	G AE												
			Manufacturer's Qualifications														
			SD-04 Samples														
			Precast Concrete Units	2.2	G AE												
			SD-06 Test Reports														
			Materials	2.1													
		04200	SD-02 Shop Drawings														
			Masonry Work	2.7	G AE												
			SD-03 Product Data														
			Clay or Shale Brick	2.2													
			Concrete Brick	2.3													
			Insulation	2.13													
			Flashing	2.15													
			Cold Weather Installation	3.1.2													
			SD-04 Samples														
			Concrete Masonry Units (CMU)	2.4													
			Concrete Brick	2.3													

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		04200	Clay or Shale Brick	2.2	G												
			Mortar	2.7.2	G												
			Anchors, Ties, and Bar Positioners	2.9													
			Expansion-Joint Materials	2.14													
			Joint Reinforcement	2.10													
			Insulation	2.13													
			Portable Panel	1.3	G												
			SD-05 Design Data														
			Pre-mixed Mortar	2.7.4	G												
			SD-06 Test Reports														
			Field Testing of Mortar	3.20.1													
			Field Testing of Grout	3.20.2													
			Prism tests	3.20.3													
			Masonry Cement	2.7.3													
			Fire-rated CMU	2.4.3													
			Special Inspection	1.5.1													
			SD-07 Certificates														
			Clay or Shale Brick	2.2													
			Concrete Brick	2.3													
			Concrete Masonry Units (CMU)	2.4													
			Control Joint Keys	2.12													
			Anchors, Ties, and Bar Positioners	2.9													
			Expansion-Joint Materials	2.14													
			Joint Reinforcement	2.10													

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CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
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		04200	Reinforcing Steel Bars and Rods	2.11													
			Masonry Cement	2.7.3													
			Mortar Coloring	2.7.2	G												
			Insulation	2.13													
			Insulation	2.13													
			Precast Concrete Items	2.5	G												
			Admixtures for Masonry Mortar	2.7.1	G												
			Admixtures for Grout	2.8.1	G												
			SD-08 Manufacturer's Instructions														
			Masonry Cement	2.7.3													
		05120	SD-02 Shop Drawings														
			Erection drawings	1.6.1	G AE												
			Fabrication drawings	1.6.1	G AE												
			SD-03 Product Data														
			Shop primer	2.4													
			Load indicator washers	2.2.4													
			SD-06 Test Reports														
			Class B coating	2.4													
			Bolts, nuts, and washers	2.2													
			SD-07 Certificates														
			Steel	2.1													
			Bolts, nuts, and washers	2.2													
			Shop primer	2.4													
			Welding electrodes and rods	2.3.1													
			Nonshrink grout	2.3.2													
			Galvanizing	2.5													

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		05120	AISC Quality Certification	1.5														
			Erection Plan	1.6.2.1														
			Welding procedures and qualifications	1.6.2.2	G AE													
		05210A	SD-02 Shop Drawings															
			Steel Joists	1.3	G AE													
			SD-07 Certificates															
			Steel Joists	1.3														
		05300A	SD-02 Shop Drawings															
			Deck Units	2.1	G AE													
			Accessories	2.5	G AE													
			Attachments	3.2	G AE													
			Holes and Openings	3.3	G AE													
			SD-03 Product Data															
			Deck Units	2.1														
			Attachments	3.2														
			SD-07 Certificates															
			Deck Units	2.1														
			Attachments	3.2														
		05400A	SD-02 Shop Drawings															
			Framing Components	2.1	G AE													
			SD-07 Certificates															
			Welds	3.2.1														
		05500A	SD-02 Shop Drawings															
			Miscellaneous Metal Items	1.6	G AE													
		06100A	SD-07 Certificates															

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		06100A	Grading and Marking	2.1.1													
			Insulation	2.3													
		06200A	SD-02 Shop Drawings														
			Finish Carpentry														
			SD-03 Product Data														
			Wood Items and Trim	2.1													
		06650	SD-02 Shop Drawings														
			Shop Drawings	1.7													
			Installation	3.2													
			SD-03 Product Data														
			Solid polymer material	2.1	G												
			Qualifications	1.6													
			Fabrications	2.3	G												
			SD-04 Samples														
			Material	2.1	G												
			Counter and Vanity Tops	2.3.4	G												
			SD-06 Test Reports														
			Solid polymer material	2.1													
			SD-07 Certificates														
			Fabrications	2.3													
			Qualifications	1.6													
			SD-10 Operation and Maintenance														
			Data														
			Solid polymer material	2.1													
			Clean-up	3.3													
		07110A	SD-07 Certificates														

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		07110A	Materials	1.4														
		07131	SD-03 Product Data															
			Elastomeric waterproofing sheet material	2.1														
			Protection board	2.3														
			Primers, adhesives, and mastics	2.1														
			SD-06 Test Reports															
			Elastomeric waterproofing sheet material	2.1														
		07220A	SD-03 Product Data															
			Application of Insulation	3.6														
			Inspection	3.7														
		07416A	SD-02 Shop Drawings															
			Structural Standing Seam Metal Roof	1.2.1	G AE													
			SD-03 Product Data															
			Design Analysis	1.2	G AE													
			Qualifications															
			SD-04 Samples															
			Roof Panels	2.1	G AE													
			Factory Color Finish	2.5	G AE													
			SD-06 Test Reports															
			Uplift Resistance	1.4	G AE													
			SD-07 Certificates															
			Structural Standing Seam Metal Roof	1.2.1	G AE													

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		07420	SD-02 Shop Drawings														
			Panels	2.1	G AE												
			Metal accessories	2.1.2	G AE												
			SD-03 Product Data														
			Panels	2.1	G AE												
			SD-04 Samples														
			Panels	2.1	G AE												
			Metal accessories	2.1.2	G AE												
			SD-06 Test Reports														
			Certified test reports	1.3													
			SD-07 Certificates														
			Materials	2.2													
		07600A	SD-02 Shop Drawings														
			Materials	2.1	G												
		07810A	SD-03 Product Data														
			Fireproofing Material	3.3													
			SD-04 Samples														
			Spray-Applied Fireproofing	2.1													
			SD-06 Test Reports														
			Fire Resistance Rating	1.7													
			Field Tests	3.5													
			SD-07 Certificates														
			Installer Qualifications	1.5													
			Surface Preparation	3.1													
			Manufacturer's Inspection	3.5.3													
		07840A	SD-02 Shop Drawings														

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		07840A	Firestopping Materials	2.1													
			SD-07 Certificates														
			Firestopping Materials	2.1													
			Installer Qualifications	1.5													
			Inspection	3.3													
		07900A	SD-03 Product Data														
			Backing	2.1													
			Bond-Breaker	2.2													
			Sealant	2.4													
			SD-04 Samples														
			sealant	2.4													
			SD-07 Certificates														
			Sealant	2.4													
		08110	SD-02 Shop Drawings														
			Doors	2.1													
			Doors	2.1													
			Frames	2.1													
			Frames	2.1													
			Frames	2.7													
			Frames	2.7													
			Accessories	2.6													
			Weatherstripping	2.9													
			SD-03 Product Data														
			Doors	2.1													
			Frames	2.1													
			Frames	2.7													

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		08110	Accessories	2.6													
			Weatherstripping	2.9													
			Fire rated doors	2.2													
			SD-04 Samples														
			Doors	2.1													
			Frames	2.1													
			Frames	2.7													
			coating	2.11.1													
		08120	SD-02 Shop Drawings														
			Doors and frames	2.1	G AE												
			SD-04 Samples														
			Finishes	2.3.8	G												
			SD-05 Design Data														
			Calculations	1.8	G AE												
			SD-06 Test Reports														
			Aluminum doors	2.3.2													
			windows	1.3.3													
			transoms	2.1													
			sidelights	2.1													
			SD-08 Manufacturer's Instructions														
			Doors and frames	2.1													
		08210	SD-02 Shop Drawings														
			Doors	2.1													
			SD-03 Product Data														
			Doors	2.1													
			Accessories	2.2													

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		08210	Water-resistant sealer	2.3.6													
			warranty	1.4													
			Sound transmission class rating	2.1.2	G												
			Fire resistance rating	2.1.3	G												
			SD-04 Samples														
			Doors	2.1													
			Door finish colors	2.3.5.2													
			SD-06 Test Reports														
			Split resistance	2.4													
			Cycle-slam	2.4													
			Hinge loading resistance	2.4													
		08330A	SD-02 Shop Drawings														
			Overhead Rolling Door Unit	1.6	G												
			SD-03 Product Data														
			Overhead Rolling Door Unit	1.6	G												
			SD-06 Test Reports														
			Tests	1.2.1													
			SD-10 Operation and Maintenance Data														
			Operation	1.6													
			Maintenance	1.6													
		08353	SD-02 Shop Drawings														
			Accordion Partitions	2.2	G												
			SD-03 Product Data														
			Accordion Partitions	2.2	G												
			SD-04 Samples														

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		08353	Accordion Partitions	2.2	G												
			SD-07 Certificates														
			Accordion Partitions	2.2													
			SD-10 Operation and Maintenance Data														
			Accordion Partitions	2.2													
		08710	SD-02 Shop Drawings														
			Hardware schedule	1.3	G												
			Keying system	2.3.7													
			SD-03 Product Data														
			Hardware items	2.3	G												
			SD-08 Manufacturer's Instructions														
			Installation	3.1													
			SD-10 Operation and Maintenance Data														
			Hardware Schedule	1.3	G												
			SD-11 Closeout Submittals														
			Key bitting	1.4													
		08810A	SD-02 Shop Drawings														
			Installation	3.2	G AE												
			SD-03 Product Data														
			Wire glassed		G AE												
			Insulating Glass	2.2	G AE												
			Glazing Accessories	2.7	G AE												
			Laminated glass;	1.6.2	G AE												
			SD-04 Samples														

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		08810A	Insulating Glass	2.2													
			SD-07 Certificates														
			Insulating Glass	2.2													
		09100N	SD-02 Shop Drawings														
			Metal support systems	2.1	G AE												
		09215A	SD-02 Shop Drawings														
			Approved Detail Drawings	1.3													
			SD-03 Product Data														
			Materials	2.1													
			SD-07 Certificates														
			Fire Resistive Construction	1.7													
			Steel Framing, Furring and Related Items	2.1.1													
		09250	SD-03 Product Data														
			Type C	2.1.1.2													
			gypsum board	2.1.1													
			Glass Mat Water-Resistant Gypsum Tile Backing Board	2.1.2													
			Accessories	2.1.8													
		09310A	SD-03 Product Data														
			Tile	2.1	G												
			Mortar and Grout	2.3	G												
			SD-04 Samples														
			Tile	2.1	G												
			Marble Thresholds	2.4	G												
			SD-07 Certificates														

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		09310A	Tile	2.1													
			Mortar and Grout	2.3													
		09390	SD-03 Product Data														
			Synthetic Finish System	3.3	G AE												
			Application	3.1.2													
			SD-04 Samples														
			Synthetic Finish System	3.3	G												
		09490	SD-03 Product Data														
			Special Coating	2.1	G AE												
			Thinning	3.3	G AE												
			Application	3.4	G AE												
			SD-04 Samples														
			Special Coating	2.1	G AE												
		09510A	SD-02 Shop Drawings														
			Approved Detail Drawings	1.3	G AE												
			SD-04 Samples														
			Acoustical Units	2.1	G												
			SD-07 Certificates														
			Acoustical Units	2.1													
		09650A	SD-03 Product Data														
			Flooring	3.2													
			SD-04 Samples														
			Flooring	3.2	G												
			SD-06 Test Reports														
			Moisture Test	3.3													
		09685N	SD-02 Shop Drawings														

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		09685N	Carpet tile installation	3.1													
			SD-04 Samples														
			Carpet tile	2.1	G												
			Carpet tile	2.1	G												
			Molding	2.3	G												
			SD-06 Test Reports														
			Flammability	2.2.8													
			Static control	2.2.9													
			CRI Green Label Requirements for Indoor Air Quality Test Criteria	1.7.1													
			ADA requirements	1.7.2													
			SD-07 Certificates														
			Installation experience	1.4.2													
			Carpet tile	2.1													
			Carpet tile	2.1													
			SD-08 Manufacturer's Instructions														
			Carpet tile installation	3.1													
			SD-10 Operation and Maintenance Data														
			Carpet tile	2.1													
			Carpet tile	2.1													
		09720A	SD-03 Product Data														
			Wallcoverings	2.1													
			Manufacturer's Instructions	3.2													
			Installation	3.3													
			Maintenance	1.6													

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		09720A	Clean-Up	3.4														
			SD-04 Samples															
			Wallcoverings	2.1	G													
			SD-07 Certificates															
			Wallcoverings	2.1														
		09900	SD-02 Shop Drawings															
			Piping identification stencil	3.10														
			SD-03 Product Data															
			Coating	2.1														
			Manufacturer's Technical Data Sheets	2.1														
			SD-04 Samples															
			Color	1.9	G													
			SD-07 Certificates															
			Applicator's qualifications	1.3														
			Qualification Testing	1.4.1.2														
			SD-08 Manufacturer's Instructions															
			Mixing	3.6.2														
			Manufacturer's Material Safety Data Sheets	1.7.2														
			SD-10 Operation and Maintenance Data															
			Coatings	2.1														
		09915	SD-04 Samples															
			Color Schedule	2.2	G													

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		10100A	SD-03 Product Data														
			Visual Display Boards	1.4	G												
			SD-04 Samples														
			Aluminum	2.2.3	G												
			Porcelain Enamel	2.2.1	G												
			Materials	2.2	G												
			SD-07 Certificates														
			Visual Display Boards	1.4													
		10160A	SD-02 Shop Drawings														
			Toilet Partition System	2.1													
			SD-03 Product Data														
			Toilet Partition System	2.1													
			SD-04 Samples														
			Toilet Partition System	2.1	G												
		10201N	SD-02 Shop Drawings														
			Wall louvers	2.2	G												
			SD-04 Samples														
			Wall louvers	2.2	G												
		10270A	SD-02 Shop Drawings														
			Raised Access Floor System	2.4	G												
			SD-03 Product Data														
			Raised Access Floor System	2.4	G												
			SD-04 Samples														
			Raised Access Floor System	2.4	G												
			SD-06 Test Reports														
			Tests	2.6	G												

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		10270A	Testing of Electrical Resistance SD-07 Certificates	3.2	G												
			Raised Access Floor System	2.4													
		10350	SD-02 Shop Drawings Flagpoles	2.1													
			SD-03 Product Data Flagpoles	2.1													
			SD-04 Samples Flagpoles	2.1	G												
			Accessories	1.4.1	G												
		10430A	SD-02 Shop Drawings Approved Detail Drawings	3.1	G												
			SD-03 Product Data Dimensional building letters	2.1													
			Installation	3.1													
			SD-04 Samples Dimensional building letters	2.1	G												
			SD-10 Operation and Maintenance Data														
			Protection and Cleaning	3.1.2													
		10440A	SD-02 Shop Drawings Modular signage system	2.1	G												
			Modular signage system	2.1.1	G												
			SD-03 Product Data Installation	3.2													
			Modular signage system	2.1													

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		10440A	Modular signage system	2.1.1													
			SD-04 Samples														
			Interior Signage	1.3	G												
			Modular signage system	2.1	G												
			Modular signage system	2.1.1	G												
			SD-10 Operation and Maintenance Data														
			Approved Manufacturer's Instructions	3.2													
			Protection and Cleaning	3.4													
		10800A	SD-03 Product Data														
			Finishes	2.1.2	G												
			Accessory Items	2.2	G												
			SD-04 Samples														
			Finishes	2.1.2	G												
			Accessory Items	2.2	G												
		10990	SD-02 Shop Drawings														
			Miscellaneous Specialty Items	1.3	G												
			SD-04 Samples														
			Miscellaneous Specialty Items	1.3	G												
		11162A	SD-02 Shop Drawings														
			Dock Lift	2.1	G												
			SD-03 Product Data														
			Dock Lift	2.1													
			SD-10 Operation and Maintenance Data														

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		11162A	Dock Lift	2.1													
		11600	SD-02 Shop Drawings														
			Solid woods	2.1.1	G												
			Lumber core	2.1.2	G												
			Plywoods	2.1.3	G												
			Particleboards	2.1.4	G												
			Tempered welded fiber	2.1.5	G												
			High pressure plastic laminate	2.1.6	G												
			SD-03 Product Data														
			Solid woods	2.1.1													
			Lumber core	2.1.2													
			Plywoods	2.1.3													
			Particleboards	2.1.4													
			Tempered welded fiber	2.1.5													
			High pressure plastic laminate	2.1.6													
			SD-04 Samples														
			Base cabinets	3.1.2	G												
			SD-10 Operation and Maintenance Data														
			equipment and materials	1.1													
		12490A	SD-02 Shop Drawings														
			Approved Detail Drawings	3.2													
			SD-03 Product Data														
			Window Treatments	3.2													
			Hardware	1.3													
			SD-04 Samples														

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		12490A	Window Treatments	3.2	G												
		13100	SD-02 Shop Drawings														
			Drawings		G AO												
			SD-07 Certificates														
			Materials	2.1	G AO												
		13210	SD-02 Shop Drawings														
			Aboveground storage tanks (AST)	2.1													
			G.														
			SD-03 Product Data														
			Aboveground storage tanks (AST)	2.1	G AE.												
			Leak Detection System	2.2.1	G AE.												
			High level alarm system	2.2.2	G AE.												
			Tank Level Gage System	2.2.3	G AE.												
			Alarm Control Panel System	2.4.1	G AE.												
			Remote alarm system	2.4.2	G AE.												
			SD-06 Test Reports														
			Field acceptance test	3.2	G AE.												
			SD-08 Manufacturer's Instructions														
			Installation instructions	3.1.1													
			SD-10 Operation and Maintenance Data														
			Aboveground storage tanks(AST)	2.1	G AE.												
			Alarm control panel system	2.4.1	G AE.												
			Accessories for AST's	2.2	G AE.												
		13280	SD-03 Product Data														

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		13280	Respiratory Protection Program	1.12	G												
			Cleanup and Disposal	3.11	G												
			Materials and Equipment	1.2													
			Qualifications	1.5	G												
			Training Program	1.11													
			Medical Requirements	1.10													
			Encapsulants	2.1	G												
			SD-06 Test Reports														
			Exposure Assessment and Air Monitoring	3.9	G												
			Local Exhaust Ventilation	1.20													
			Licenses, Permits and Notifications	1.14	G												
			SD-07 Certificates														
			Equipment	1.23													
		13281	SD-03 Product Data														
			Materials and Equipment	1.18													
			Expendable Supplies	1.19													
			Qualifications	1.5	G												
			SD-06 Test Reports														
			Licences, Permits, and Notifications	1.11	G												
			Accident Prevention Plan (APP)	1.7	G												
			Sampling and Analysis	1.13	G												
			Clearance Report	3.8	G												
		13722	SD-02 Shop Drawings														

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		13722	Sound Masking System		G												
			AE														
			SD-03 Product Data														
			Spare Parts		G												
			RE														
			SD-06 Test Reports														
			Approved Test Procedures		G												
			AE		G												
			Acceptance Tests	3.4	G												
			SD-07 Certificates														
			AE														
			Materials and Equipment														
			GA														
			Sound Masking System Installer														
			Qualification														
			SD-10 Operation and Maintenance														
			Data														
			Sound Masking System, Data		G												
			Package 3														
			AE														
		13930	SD-02 Shop Drawings														
			Sprinkler System Shop Drawings		G AE												
			As-Built Shop Drawings														
			SD-03 Product Data														
			Fire Protection Related Submittals	3.1													
					AE."												

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		13930	Components and Equipment Data		G AE												
			Hydraulic Calculations	1.7	G AE												
			Spare Parts		AE"												
			Preliminary Tests Procedures		G RE												
			Final Acceptance Test Procedures		G RE												
			On-site Training Schedule		G RE												
			Preliminary Tests	3.10	G RE												
			Final Acceptance Test		G RE												
			Fire Protection Specialist		G												
			Qualifications														
			RE														
			Sprinkler System Installer	1.9	G RE												
			Qualifications														
			SD-06 Test Reports														
			Preliminary Tests Report		G												
			RE														
			Final Acceptance Test Report		G RE												
			SD-07 Certificates														
			Fire Protection Specialist		G RE												
			Inspection														
			SD-10 Operation and Maintenance														
			Data														
			Wet Pipe Sprinkler System		G RE												
		14240A	SD-02 Shop Drawings														
			Elevator System		G												

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		14240A	SD-03 Product Data														
			Training Data		G												
			Elevator System														
			Framed Instructions	3.7													
			Test Procedures		G												
			SD-04 Samples														
			Finishes														
			SD-06 Test Reports														
			Testing	3.6	G												
			SD-07 Certificates														
			Qualification Certificates														
			SD-10 Operation and Maintenance Data														
			Elevator System		G												
		15080	SD-04 Samples														
			Thermal Insulation Materials														
		15190	SD-02 Shop Drawings														
			Gas Piping System	3.2	G AE												
			SD-06 Test Reports														
			Testing														
			Pressure Tests	3.15.1													
			Test With Gas	3.15.3													
		15400	SD-02 Shop Drawings														
			Plumbing System	3.7.1													
			Electrical Schematics														
			SD-03 Product Data														

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		15400	Welding	1.5.1													
			Plumbing Fixture Schedule	3.8	G AE												
			Vibration-Absorbing Features		G AE												
			Plumbing System	3.7.1	G AE												
			SD-06 Test Reports														
			Tests, Flushing and Disinfection	3.7													
			Backflow Prevention Assembly		G AE												
			Tests														
			SD-07 Certificates														
			Materials and Equipment														
			Bolts	2.1.1													
			SD-10 Operation and Maintenance														
			Data														
			Plumbing System	3.7.1													
		15569	SD-03 Product Data														
			Manufacturer's Catalog Data		G AE.												
			Spare Parts Data														
			Water Treatment Plan														
			Boiler Water Treatment	2.12													
			Heating System Tests	3.6													
			Qualification														
			Field Instructions	3.8													
			Tests	3.3													
			SD-06 Test Reports														
			Heating System Tests	3.6													
			Water Treatment Tests														

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		15569	SD-10 Operation and Maintenance Data														
			Heating System														
			Water Treatment System	2.12													
		15601	SD-02 Shop Drawings														
			Water chillers	2.1													
			SD-03 Product Data														
			Water chillers	2.1													
			Electric motors and starters	2.1.1.9													
			SD-06 Test Reports														
			Start-up and initial operational tests	3.5.1													
			SD-10 Operation and Maintenance Data														
			Water Chillers	2.1													
			Electric motors and starters	2.1.1.9													
		15895	SD-02 Shop Drawings														
			Drawings	3.1.1	G												
			AE														
			Installation	3.1	G												
			SD-03 Product Data														
			Components and Equipment	2.1	G												
			AE														
			Test Procedures														
			Welding Procedures														
			System Diagrams		G												

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		15895	AE. Similar Services Welding Joints Testing, Adjusting and Balancing Field Training SD-06 Test Reports Performance Tests SD-10 Operation and Maintenance Data Operating and Maintenance Instructions	3.6 3.8    3.7   3.8	G AE.     G AE												
		15951	SD-02 Shop Drawings HVAC Control System SD-03 Product Data Service Organizations Equipment Compliance Booklet Commissioning Procedures Performance Verification Test Procedures Training SD-06 Test Reports Commissioning Report Performance Verification Test SD-10 Operation and Maintenance Data Operation Manual	3.1.1   1.6 3.4 1.6  3.6  3.6.2 3.5.3  1.5	G AE.   G AE. G RE. G AE. G RE.   G AE. G AE.   G AE.												

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OPERATIONS SUPPORT CENTER, LANGLEY AIR FORCE BASE, VA																	
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		15951	Maintenance and Repair Manual	1.6													
		15990	SD-02 Shop Drawings														
			TAB Schematic Drawings and Report Forms	3.3	G AE.												
			SD-03 Product Data														
			TAB Related HVAC Submittals	3.2													
			TAB Procedures	3.5.1	G AE.												
			Calibration	1.4													
			Systems Readiness Check	3.5.2	G AE.												
			TAB Execution	3.5.1	G AE.												
			TAB Verification	3.5.4	G AE.												
			SD-06 Test Reports														
			Design Review Report	3.1	G AE.												
			Systems Readiness Check	3.5.2	G AE.												
			TAB Report	3.5.3	G AE.												
			TAB Verification Report	3.5.4	G AE.												
			SD-07 Certificates														
			Ductwork Leak Testing	3.4	G AE.												
			TAB Firm	1.5.1	G AE.												
			TAB Specialist	1.5.2	G AE.												
		15995	SD-03 Product Data														
			Commissioning Team	3.1													
			Test Procedures		G AE.												
			Test Schedule		G AE.												
			SD-06 Test Reports														
			Test Reports		G AE.												

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		16070	SD-02 Shop Drawings														
			Lighting Fixtures in Buildings	3.2	G AE.												
			Equipment Requirements	1.4	G AE.												
			SD-03 Product Data														
			Lighting Fixtures in Buildings	3.2	G AE.												
			Equipment Requirements	1.4	G AE.												
			Contractor Designed Bracing	1.3.4	G AE.												
		16261	SD-02 Shop Drawings														
			Schematic diagrams	1.5.1	G												
			Interconnecting diagrams	1.5.2	G AE.												
			Installation drawings	1.5.3	G AE.												
			SD-03 Product Data														
			Variable frequency drives	2.1	G AE.												
			Wires and cables	2.3													
			Equipment schedule	1.5.4													
			SD-06 Test Reports														
			VFD Test G.														
			Performance Verification Tests	3.2.2													
			Endurance Test	3.2.3													
			SD-08 Manufacturer's Instructions														
			Installation instructions	1.5.5													
			SD-09 Manufacturer's Field Reports														
			VFD Factory Test Plan	2.5.1													
			G.														
			Factory test results	1.5.6													

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		16261	SD-10 Operation and Maintenance Data															
			Variable frequency drives	2.1														
		16263	SD-02 Shop Drawings															
			Layout	3.6	G													
			General Installation	3.1	G													
			Acceptance	3.8	G													
			SD-03 Product Data															
			Performance Criteria		G													
			Sound Limitations	2.6	G													
			Harmonic Requiremants		G													
			Engine-Generator Parameter Schedule	1.4.1														
			G.															
			Integral Main Fuel Storage Tank		G													
			Day Tank	2.3.4	G													
			Power Factor	3.5.1.2	G													
			Heat Rejected To		G													
			Engine-Generator Space															
			Cooling System	2.5	G													
			Time-Delay on Alarms	2.17.5	G													
			Generator	2.13	G													
			Manufacturer's Catalog	2.2	G													
			Site Welding	1.5.6														
			Spare Parts															
			Onsite Training	3.7														

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		16263	Battery Charger	2.11.3.2													
			Vibration-Isolation	1.5.11	G												
			Posted Data and Instructions	3.6													
			Instructions	3.5.4.1	G												
			Experience	1.5.15													
			Field Engineer	1.5.16													
			General Installation	3.1	G												
			SD-06 Test Reports														
			Factory Inspection and Tests	2.26													
			Factory Tests	2.26.2													
			Onsite Inspection and Tests	3.5													
			SD-07 Certificates														
			Vibration Isolation	1.5.11													
			Prototype Test	2.26.2													
			Reliability and Durability	1.4.4													
			Emissions	2.10													
			Sound Limitations	2.6													
			Site Visit														
			Flywheel Balance														
			Materials and Equipment	2.1													
			Inspections	3.5.3													
			Cooling System	2.5													
			SD-10 Operation and Maintenance														
			Data														
			Operation and Maintenance	3.7													
			Manuals														

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		16263	Maintenance Procedures	3.7													
			Special Tools	2.12													
			Filters	2.4.2													
		16265	SD-02 Shop Drawings														
			UPS System		G AE.												
			Installation	3.1	G AE.												
			SD-03 Product Data														
			Performance Requirements	1.3.4	G AE.												
			Spare Parts														
			G.														
			Field Training	3.6													
			SD-06 Test Reports														
			Factory Testing	2.13	G AE.												
			Field Supervision, Startup and Testing	3.4	G AE.												
		16370	SD-02 Shop Drawings														
			Electrical Distribution System	3.9.3	G												
			AE.														
			As-Built Drawings		G												
			SD-03 Product Data														
			Nameplates	2.3	G												
			AE.														
			Material and Equipment	2.2	G												
			General Installation Requirements	3.1	G												
			SD-06 Test Reports														
			Factory Tests		G												

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		16370	AE.														
			Field Testing	3.9	G												
			Operating Tests	3.9.6	G												
			SD-07 Certificates														
			Material and Equipment	2.2	G												
			SD-10 Operation and Maintenance Data														
			Electrical Distribution System	3.9.3	G												
		16375	SD-02 Shop Drawings														
			Electrical Distribution System	3.11.3	G												
			AE														
			As-Built Drawings														
			SD-03 Product Data														
			Fault Current Analysis	2.18.4	G												
			AE														
			Protective Device	2.18	G												
			Coordination Study	2.18.5	G												
			Nameplates	2.2	G												
			Material and Equipment	2.1	G												
			General Installation Requirements	3.1	G												
			AE.														
			SD-06 Test Reports														
			Factory Tests	2.16	G												

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		16375	AE														
			Field Testing	3.11	G												
			Operating Tests	3.11.8	G												
			Cable Installation	3.2.1.4	G												
			SD-07 Certificates														
			Material and Equipment	2.1	G												
			Cable Joints	3.3	G												
			Cable Installer Qualifications		G												
			SD-10 Operation and Maintenance Data														
			Electrical Distribution System	3.11.3	G												
		16415	SD-02 Shop Drawings														
			Interior Electrical Equipment		G AE												
			SD-03 Product Data														
			Fault Current and Protective Device Coordination Study		G AE												
			Manufacturer's Catalog		G AE												
			Material, Equipment, and Fixture Lists		G AE												
			Installation Procedures		G AE												
			As-Built Drawings	1.2.6													
			G.														
			Onsite Tests	3.22.2	G												
			SD-06 Test Reports														
			Factory Test Reports		G AE												
			Field Test Plan		G AE												

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		16415	Field Test Reports	3.20	G AE												
			SD-07 Certificates														
			Materials and Equipment	1.4	G AE												
		16442	SD-02 Shop Drawings														
			Switchgear Drawings	1.4.2	G												
			AE														
			Paralleling Control System		G												
			SD-03 Product Data														
			Switchgear	2.2	G												
			AE														
			Paralleling Control System		G												
			Paralleling Control System		G												
			software and Programming														
			SD-06 Test Reports														
			Switchgear design tests	2.6.2	G												
			AE														
			Switchgear production tests	2.6.3	G												
			Acceptance checks and tests	3.5.1	G												
			Paralleling Operational Test		G												
			SD-10 Operation and Maintenance														
			Data														
			Switchgear Operation and	1.5.1	G												
			Maintenance														
			AE														
			SD-11 Closeout Submittals														

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		16442	Assembled Operation and Maintenance Manuals	1.5.2													
			Equipment Test Schedule	2.6.1	G												
			AE														
			Request for Settings		G												
			Paralleling Operational Performance		G												
		16443	SD-02 Shop Drawings														
			Switchboard Drawings	1.4.2	G												
			AE.														
			SD-03 Product Data														
			Switchboard	2.2	G												
			AE.														
			SD-06 Test Reports														
			Switchboard design tests		G												
			AE.														
			Switchboard production tests		G												
			Acceptance checks and tests	3.5.1													
			G.														
			SD-10 Operation and Maintenance Data														
			Switchboard Operation and Maintenance	1.5.1	G												
			AE.														
			SD-11 Closeout Submittals														

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		16443	Assembled Operation and Maintenance Manuals AE. Equipment Test Schedule	1.5.2	G												
		16444	SD-02 Shop Drawings Switchboard Drawings AE. SD-03 Product Data Switchboard AE. SD-06 Test Reports Acceptance checks and tests G. SD-10 Operation and Maintenance Data Switchboard Operation and Maintenance AE. SD-11 Closeout Submittals Assembled Operation and Maintenance Manuals AE. Equipment Test Schedule	1.4.2 2.2 3.5.1	G G												
		16475	SD-03 Product Data Fault Current Analysis	2.11	G AE.												

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		16475	Protective Device Coordination Study	2.11	G AE.												
			Equipment	2.1	G AE.												
			System Coordinator	1.4.1	G AE.												
			Installation	3.2	G AE.												
			SD-06 Test Reports														
			Field Testing	3.3	G AE.												
			SD-07 Certificates														
			Devices and Equipment	1.6	G AE.												
		16528	SD-02 Shop Drawings														
			Lighting System	1.3.1	G												
			Detail Drawings		G												
			AE.														
			As-Built Drawings	3.12.2													
			G.														
			SD-03 Product Data														
			Equipment and Materials		G												
			AE.														
			Spare Parts														
			G.														
			SD-06 Test Reports														
			Operating Test	3.12.1	G												
			Ground Resistance	3.12.2													
			Measurements														
			G.														

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		16528	SD-10 Operation and Maintenance Data														
			Lighting System G.	1.3.1													
		16770	SD-02 Shop Drawings														
			Radio and Public Address System AE.	1.2	G												
			SD-03 Product Data														
			Spare Parts														
			SD-06 Test Reports														
			Approved Test Procedures AO.	3.3	G												
			Acceptance Tests	3.3	G												
			SD-07 Certificates														
			AE.														
			SD-10 Operation and Maintenance Data														
			Radio and Public Address System, Data Package 3		G												
			AO.														
		16783	SD-02 Shop Drawings														
			wiring diagrams and installation details	1.6.1	G												
			AE.														
			system components	1.4.4	G												
			SD-03 Product Data														

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		16783	Attenuators	2.2.2													
			Amplifiers	2.3.1													
			Cables	2.3.2													
			Terminators	2.3.3													
			Splitters/combiners	2.3.4													
			Line Taps	2.3.5													
			G.														
			Outlets	2.3.6													
			Connectors	2.3.7													
			Tilt compensator	2.3.8													
			Grounding block	2.4.1													
			SD-05 Design Data														
			CATV System Loss Calculations	1.6.2	G AE.												
			SD-06 Test Reports														
			Operational test plan	1.6.3	G												
			.														
			Operational test procedures	1.6.4													
			G.														
			System pretest	3.2.1													
			Acceptance tests	3.2.2													
			SD-08 Manufacturer's Instructions														
			Connector Installation	1.6.5													
			G.														