

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE	PAGE OF PAGES	
				J	1	2
2. AMENDMENT/MODIFICATION NO. 0004		3. EFFECTIVE DATE 21-Feb-2003	4. REQUISITION/PURCHASE REQ. NO. W68MD9-2346-3730		5. PROJECT NO.(If applicable)	
6. ISSUED BY USA ENGINEER DISTRICT, SEATTLE ATTN: CENWS-CT P.O. BOX 3755 SEATTLE WA 98124-3755		CODE DACA67	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)				X	9A. AMENDMENT OF SOLICITATION NO. DACA67-03-R-0207	
				X	9B. DATED (SEE ITEM 11) 27-Jan-2003	
					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 type="checkbox"/> is extended, <input checked="" 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.) DACA67-03-R-0207 Replace Family Housing, Phase 6A Malmstrom AFB, Montana This amendment is provided to clarify drawings and specifications.						
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		15C. DATE SIGNED	16B. UNITED STATES OF AMERICA		16C. DATE SIGNED	
_____ (Signature of person authorized to sign)			BY _____ (Signature of Contracting Officer)		21-Feb-2003	

EXCEPTION TO SF 30  
APPROVED BY OIRM 11-84

30-105-04

STANDARD FORM 30 (Rev. 10-83)  
Prescribed by GSA  
FAR (48 CFR) 53.243

## SECTION SF 30 BLOCK 14 CONTINUATION PAGE

**The following items are applicable to this modification:**CONT. SHEET

- A. This amendment is issued to provide the following revisions to this solicitation:
1. The Following Technical Specifications are revised: 13110 Cathodic Protection by Galvanic Anodes and 16710 Communications Circuits.
  2. Revision to drawings, plate numbers:
    - a. CIVIL DRAWINGS - C-503
    - b. STRUCTURAL DRAWINGS - S-102, S-103, S-502, S-504
    - c. ELECTRICAL DRAWINGS - E-002, E-003
- B. The attached revised sections are to be replaced in their entirety. All changes are generally identified, for convenience, either by strikeout for deletions, and underlining of text for additions, or a single dark line in the margin. All portions of the revised or new page shall apply whether or not changes have been indicated.
- C. The time and due date for submission of the technical and price proposals remains **unchanged**: 2:00 PM (PST), 26 February 2003.
- D. Offerors must acknowledge receipt of this amendment by number and date on Standard Form 1442, BACK, in block 19, or by telegram.

## Enclosures:

13110 Cathodic Protection by Galvanic Anodes

16710 Communications Circuits

Drawings

C-503

S-102

S-103

S-502

S-504

E-002

E-003

## SECTION 13110

### CATHODIC PROTECTION BY GALVANIC ANODES

#### PART 1 - GENERAL

##### 1.1 RELATED REQUIREMENTS

- A. Reference Division 16 - Electrical

##### 1.2 SUBMITTAL

- A. Submit the following in accordance with Section 01330, "Submittal Procedures."
  - 1. Shop Drawings
    - a. Insulating flange sets
    - b. Joint bonds
  - 2. Product Data
    - a. Anodes; G
    - b. Insulating flange sets
    - c. Dielectric unions
    - d. Wires
    - e. Cable and wire
    - f. Casings, insulation, and seals
    - g. Shunt resistors
    - h. Permanent reference electrodes; G
  - 3. Certificates
    - a. Qualifications of Corrosion Engineer; G
  - 4. Operation and Maintenance Data
    - a. Cathodic Protection System, Data Package 5; G
      - 1) Submit operation and maintenance data in accordance with Section 01701, "Operation and Maintenance Manuals"
  - 5. Closeout Submittals
    - a. Final Cathodic Protection System Field Test Report; G

##### 1.3 SERVICES OF CORROSION ENGINEER

- A. The Contractor shall obtain the services of a corrosion engineer to supervise, inspect and test the installation of the cathodic protection system(s). Corrosion Engineer refers to a registered professional engineer with certification of licensing that includes education and experience in cathodic protection of buried or submerged metal structures, or a person accredited or certified by the National Association of Corrosion Engineers at the level of Corrosion Specialist or Cathodic Protection Specialist. Such a person shall have not less than five years experience in the cathodic protection of underground water or gas lines. The contractor shall submit evidence of the qualifications of corrosion engineer to the Contracting Officer for review and approval.

## PART 2 - PRODUCTS

### 2.1 ANODES

A. Magnesium: ASTM B 843 Chemical composition as follows:

1. Aluminum 0.01 percent maximum
2. Manganese 0.5-1.3 percent
3. Zinc -0- percent maximum
4. Silicon 0.05 percent maximum
5. Copper 0.02 percent maximum
6. Nickel 0.001 percent maximum
7. Iron 0.03 percent maximum
8. Other Impurities 0.05 percent each, 0.3 percent maximum total
9. Magnesium Remainder
  - a. Bare Anode Weight: 17 lbs not including core.

B. Anode Wires and Core:

1. Anode Lead Wires: UL 83, Type THWN THHN solid copper conductors, not less than No. 12 AWG, 20 feet long, of sufficient length to extend to the accompanying junction box without splicing. Anode lead wire shall be factory installed. Silver solder the lead wire to the anode core, and seal the soldered connection and recessed end of the anode with a dielectric sealing compound.
2. Anode Core: Spring spiral 10 ga galvanized steel core.

C. Anode Backfill: Chemical composition as follows:

1. Hydrated Gypsum: 75 percent
2. Bentonite Clay: 20 percent
3. Sodium Sulfate: 5 percent

Provide granular backfill with 100 percent passing through a 150 micrometers screen. Provide prepackaged anode in a cloth bag containing the anode and backfill. Center the anode in the firmly packed backfill using spacers. Overall dimensions of the bagged 17 lb. anode shall be 165 by 6-1/2 by 17 inches with a total minimum weight of 45 lbs nominal.

### 2.2 TEST STATIONS

A. Flush Mounted Type: NEMA ICS 6. Metallic or non-metallic with terminal board, 6 terminal posts and lockable lid. The unit shall be CP Test Srvs 'Glen 4' of standard design, manufactured for use as a cathodic protection test station, complete with cover, terminal board, shunts, and nickel plated brass hardware. The terminal board shall be removable for easy access to wires. Provide cast iron locking valve box cover. The yellow cover shall have a cast in legend "CP TEST".

B. Terminal Boards: Provide terminal boards for test stations made of phenolic. Insulated terminal boards shall have 6 terminals. Install copper lugs, copper buss bars and shunts on the terminal board as indicated. Test station terminal connections shall be permanently tagged to identify each termination of conductors (e.g. identify the conductors connected to the protected structure, anodes, and reference electrodes). Conductors shall be permanently identified by means of plastic Panduit PLF1MA marker ties to indicate termination. Each conductor shall be color coded as follows:

1. Anode Lead Wire: Black
  2. Structure Lead Wire: White
  3. Reference Electrode Lead Wire: Yellow or orange
- C. Shunt Resistors: One/tenth (.1), two ampere, read Cott type shunts.
- D. Cast-In-Place Concrete: Flush mount type test stations, shall be centered in a 460 x 460 x 102 mm concrete slab. Concrete shall be 20 Mpa minimum ultimate 28-day compressive strength with 25 mm minimum aggregate conforming to Section 03300, "Cast-in-Place Concrete".

### ~~2.3 PERMANENT REFERENCE ELECTRODES~~

~~A. Permanent reference electrodes shall be copper-copper sulfate specifically manufactured for underground use, 2 inch diameter, by 7 inches long, plastic tube with anion trap to minimize contamination of the cell, and a minimum surface sensing area of 3.14 square inches. The cell shall be prepackaged by the manufacturer with a backfill material as recommended by the manufacturer. Provide cells with No. 14 AWG, RHW cable of sufficient length to extend to the test station without splicing. Reference electrodes shall have a minimum 15 year life, stability of plus or minus 5 millivolts under 3 microamp load, and an initial accuracy of plus or minus 10 millivolts referenced to a calibrated portable reference electrode.~~

### 2.42.3 CABLE AND WIRE OTHER THAN ANODE LEAD WIRES

- A. THWN or THHN stranded copper conductor, color coded and #12 sized Test Station Lead Wire. Copper wires shall conform to ASMT B2 and ASTM B8. No. 12 or 14 AWG lead wires terminating at a junction box or test station shall have a cable identification tag. Do not use bare copper wire for joint continuity bonds. Refer to anode lead wires. Joint bond wires shall be #8 AWG stranded copper with HMWPE insulation.

### 2.52.4 CABLE AND WIRE IDENTIFICATION TAGS

- A. Panduit PLF1MA Marker Ties. Print letters with Panduit PFX-0 Pen. Provide identifier in accordance with the drawings.

### 2.62.5 WIRE CONNECTORS

- A. Use soldered terminal or solderless copper lugs for terminating test station leads.

### 2.72.6 UNDERGROUND SPLICES

- A. Provide splices with a compression connector on the conductors, and insulation and waterproofing using one of the following methods which are suitable for continuous submersion in water and comply with ANSI C119.1.
1. Provide cast-type splice insulation by means of molded casting process employing a thermosetting epoxy resin insulating material applied by a gravity poured method or pressure injected method. Provide component materials of the resin insulation in a packaged form ready for convenient mixing without removing from the package.
    - a. Gravity poured method shall employ materials and equipment contained in and approved commercial splicing kit which includes a mold suitable for the cables to be spliced. When the mold is in place around the joined conductors, prepare the resin mix and pour into the mold.

2. Provide heavy wall heat shrinkable splice insulation by means of a thermoplastic adhesive sealant material which shall be applied by a clean burning propane gas torch.

#### 2-82.7 CONDUIT

- A. Reference related specification sections.
- B. Buried Cable Warning and Identification Tape: Polyethylene tape, manufactured for warning and identification of buried cable and conduit. Tape shall be 3 inches wide, Yellow in color and read "Caution Buried Cable Below" or similar. Color and lettering shall be permanent and unaffected by moisture or other substances in backfill materials.

#### 2-92.8 INSULATING TAPE

- A. UL 510.

#### 2-102.9 INSULATING FLANGE SETS

- A. Provide full-faced gaskets, insulating sleeves and washers, and steel washers. Provide insulating flange sets rated for operation at the rated pressure and temperature.
- B. Gaskets: ASME B16.21. Neoprene faced phenolic material rated service application (gas or water).
- C. Insulating Washers and Sleeves: Two sets 3 mm laminated phenolic for operation at 450 degrees F. Insulating washers shall fit within the bolt facing on the flange over the outside of the fabric reinforced phenolic sleeve.
- D. Washers: Steel, cadmium plated, to fit within the bolt facing on the flange.

#### 2-112.10 STEEL FLANGES AND BOLTING

- A. Steel Flanges: ASME B16.5, 150 lb. or 300 lb as required by application.
- B. Bolting: ASMT A307, Grade B for bolts; ASTM A 194/A 194M, Grade 2 for nuts. Dimensions: ASME B18.2.1 for bolts, ASME B18.2.2 for nuts. Threads: ASME B1.1, Class 2A fit for bolts, Class 2B fit for nuts. Bolts shall extend completely through the nuts and may have reduced shanks of a diameter not less than the diameter at the roof of threads.

#### 2-122.11 DIELECTRIC UNIONS

- A. ASME B16.39, Class 1 or 2, for dimensional, strength, and pressure requirements. Insulation barrier shall limit galvanic current to one percent of the short-circuit current in a corresponding metallic joint. Provide insulating material impervious to water or gas.

#### 2-132.12 EXOTHERMIC WELD KITS

- A. Exothermic weld kits specifically designed by the manufacturer for welding the types of materials and shapes provided.

### 2.142.13 ELECTRICALLY INSULATING COATINGS

- A. Comfortable water tight sealant having dielectric strength not less than 15 kV for a 3 mm thick layer.

### 2.152.14 CASING INSULATORS AND SEALS

- A. Casing insulators shall have a minimum 12 inch band width, constructed of heat fused plastic coated steel and multi-segmented to attach firmly around the pipe. Casing end seals shall be S-shaped rubber seals with stainless steel straps.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. IEEE C2.
- B. Anodes and Lead Wires: Provide each anode and lead wires as follows:
  1. Excavate hole to a minimum 3 inches larger than the packaged anode diameter, at or below the protected structure depth.
  2. Excavate lead wire trench to 24 inches deep, to suitable installation width.
  3. Do not lift or support anode by the lead wire. Where applicable, remove manufacturer's plastic wrap/bag from the anode. Exercise care to preclude damaging the cloth bag and the lead wire insulation.
  4. Center the packaged anode in the hole with native soil in layers not exceeding 6 inches. Hand tamp each layer to remove voids taking care not to strike the anode lead wire. When the backfill is 6 inches above the top of the anode, pour not less than ten gallons of water into the hole to saturate the anode backfill and surrounding soil. Anodes shall not be backfilled prior to inspection and approval by the Contracting Officer.
  5. Cover the lead wire trench bottom with a 3 inch layer of sand or stone free earth. Center wire on the backfill layer, do not stretch or kink the conductor. Place backfill over wire in layers not exceeding 6 inches deep, compact each layer thoroughly. Do not place tree roots, wood scrap, vegetable matter and refuse in backfill. Place cable warning tape within 18 inches of finished grade, above cable and conduit.
  6. Connect anode lead wire(s) to the test station terminal board(s), directly to the protected structure(s) by use of exothermic weld kit(s). Clean the structure surface by scraping, filing or wire brushing to produce a clean, bright surface. Weld connections using exothermic kit(s) in accordance with the kit manufacturer's instructions. Check and verify adherence of the bond to the substrate for mechanical integrity by striking the weld with a 2 lb hammer. Cover connections with an electrically insulating coating which is compatible with the existing coating on the structure. Allow sufficient slack in the lead wire to compensate for movement during backfilling operation.
  7. Connect structure leads to structure by use of exothermic weld kit(s). Clean the structure surface by scraping, filing or wire brushing to produce a clean, bright surface. Weld connections using exothermic kit(s) in accordance with the kit manufacturer's instructions. Conform to the safety precautions of paragraph 3.1.2. Check and verify adherence of the bond to the substrate for mechanical integrity by striking the weld with a 2 lb hammer. Cover connections with an electrically insulating coating which is compatible with the existing coating on the structure. Connect structure lead wires to the test station terminal board(s).

- C. Safety Precautions for Welding: Contractor shall take proper safety precautions prior to and during welding. Exothermic weld connections shall be spaced a minimum of 6 inches apart. In the event of an unsuccessful weld, the new weld location shall be located a minimum of 6 inches from the unsuccessful weld and any other existing welds.
- D. Test Stations ~~and Permanent Reference Electrodes~~: Provide test stations ~~and permanent reference electrodes~~ as indicated as follows:
1. At each anode or groups of anodes.
  2. At all insulating joints.
  3. At both ends of casings.
  4. Where the pipe (if metallic) connects to an existing piping system.
  5. Where the pipe (if metallic) connects to a dissimilar metal pipe.
- Do not fill the bottom of the test station with concrete unless otherwise specified. Do not place rubbish, scrap or other debris into the test station.
- ~~a. Permanent Reference Electrode Calibration and Installation: Provide prepackaged, copper-copper sulfate reference electrode(s) as indicated in the drawings. Prior to installation, soak the prepackaged reference electrode in a container of potable water for 30 minutes. Do not use seawater. Calibrate the permanent reference electrode in the presence of the Contracting Officer or his approved representative by measuring the potential difference between the permanent reference electrode and an independent (portable) calibrated reference electrode placed in the water adjacent to the permanent reference electrode. Potential differences between the two electrodes of the same generic type should not exceed 25 millivolts when the sensing windows of the two electrodes being compared are not more than 1/6 inch apart but not touching. Permanent reference electrodes not within these potential differences shall be removed from the construction site by the end of the day and replaced at the Contractor's expense.~~
- E. Insulating Flange Sets: Provide insulating flange sets aboveground as indicated. Locate insulating flanges on lines entering buildings at least 12 inches above grade or floor level. Cut piping and provide flanges into place. Carefully align flange bolt holes and weld flange to pipe in accordance with ASME B16.25. Electrically isolate pipelines entering buildings from the structure wall either below or above ground with an electrically isolating wall sleeve. Provide insulating flange sets into place without springing or forcing. Carefully install flange bolt sleeves to avoid damage to the sleeves.
- F. Dielectric Unions: Cut pipe ends square, remove fins and burrs, cut taper pipe threads in accordance with ASME B1.20.1. Provide insulating unions as indicated. Work piping into place without springing or forcing. Apply joint compound or thread tape to male threads only. Backing off to permit alignment of threaded joints shall not be permitted. Engage threads so that not more than three threads remain exposed. Cover unions with an electrically insulating coating.
- G. Joint Bonds: Provide 2 each #8 AWG joint bonds on metallic pipe to and across buried flexible couplings, mechanical joints, flanged joints except at places where insulating joints are specified and joints not welded or threaded to provide electrical continuity. Connect bond wire(s) to the structure(s) by use of exothermic weld kit(s). Clean the structure surface by scraping, filing or wire brushing to produce a clean, bright surface. Weld connections using exothermic kits in accordance with the kit manufacturer's instructions. Check and verify adherence of the bond to the substrate for mechanical integrity by striking the weld with a 2 lb hammer. Cover

connections with an electrically insulating coating which is compatible with the existing coating on the structure.

- H. Casings, Insulation, and Seals: Where the pipeline is installed in a casing under a roadway or railway, insulate the pipeline from the casing, and seal the annular space against intrusion of water.
- I. Concrete: Concrete shall be 3000 psi minimum ultimate 28-day compressive strength with one inch minimum aggregate conforming to Section 03300, "Cast-in-Place Concrete".
- J. Reconditioning of Surfaces:
  - 1. Restoration of Sod: Restore unpaved surfaces disturbed during the installation of anodes and wires to their original elevation and condition. Preserve sod and topsoil carefully and replace after the backfilling is completed. Where the surface is disturbed in a newly seeded area, re-seed the area with the same quality and formula of seed as that used in the original seeding.
  - 2. Restoration of Pavement: Repair pavement, sidewalks, curbs, and gutters where existing surfaces are removed or disturbed for construction.

### 3.2 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by the Contracting Officer or his designated representative. Advise the Contracting Officer 5 days prior to performing each field test. Quality control for the cathodic protection system shall consist of the following:
  - 1. Initial field testing by the contractor upon construction.
  - 2. Final field testing by the contractor.
- B. Testing:
  - 1. Final Cathodic Protection System Field Testing: Systems shall be tested and inspected by the Contractor's corrosion engineer in the presence of the Contracting Officer's corrosion protection engineer or an approved representative. Record test data, including date, time, and locations of testing. Contractor shall correct and retest, at his expense, deficiencies in the materials and installation observed by these tests and inspections. Testing shall include the following measurements.
    - a. Base Potential Test: At least 24 hours after backfilling of the pipe and installation of the anodes, but before connection of anodes to the structure, measure base (native) structure-to-electrolyte potentials of the pipe and casing structure. Perform measurements at test stations and other locations suitable for test purposes (such as service risers or valves). The locations of these measurements shall be identical to the locations specified for potential measurements with anodes connected. Use the same measuring equipment that is specified for measuring protected potential measurements.
    - b. Insulation Joint Testing: Perform insulation testing at each insulating joint or fitting prior to burying the joint of fitting and during the connection of anodes to the pipe at anode junction box and/or test station. After connection, test by measuring the potential shift on both sides of the insulating joint. These tests shall demonstrate that no metallic contact or short circuit exists between the two insulated sections of the pipe. Report and repair defective insulating flanges at the Contractor's expense.
    - c. Electrical Continuity Testing: Perform electrical continuity testing for joint bonded pipe prior to backfilling of the pipe by the potential shift method.

- d. Pipe Casing Testing: Before final acceptance of the installation, test the electrical insulation of the carrier pipe from casings and correct any short circuits.
  - e. Anode-to-Soil Potential and Anode Output Testing: Measure anode-to-soil potential of each anode with the anode disconnected through the test stations. After connecting the anodes to the pipe, measure current output of each anode across the shunt installed.
  - f. Protected Potential Measurement Tests: With the entire galvanic protection system put into operation for at least 1/2 hour, measure potentials along the pipeline and at all casings using a portable copper-copper sulfate and all permanent reference electrodes and a voltmeter having an input impedance of not less than 10 megohm. The locations of these measurements shall be identical to the locations used for the base potential measurements.
  - g. Interference Testing: Perform interference testing with respect to any crossing and nearby foreign pipes in cooperation with the owner of the foreign pipes. The testing shall verify that the cathodic protection system does not have a deleterious effect on the foreign pipelines, and vice versa. Prepare a full report of the tests giving all details including remedial actions taken or recommendations to correct noted interference problems.
2. Final Cathodic Protection System Field Test Report: The contractor shall submit a field test report of the cathodic protection system. All structure-to-electrolyte measurements, including initial potentials and anode outputs, shall be recorded on applicable forms. Identification of test locations, test station and anode test stations shall coordinate with the as-built drawings and be provided on system drawings included in the report. The contractor shall locate, correct, and report to the Contracting Officer any short circuits encountered during the checkout of the installed cathodic protection system.
- C. Criteria for Cathodic Protection: Conduct in accordance with NACE REP0169 or NACE RP0285. Criteria for determining the adequacy of protection shall be selected by the corrosion engineer as applicable:
1. A negative voltage of at least 850 millivolts as measure between the structure surface and a saturated copper-copper sulfate reference electrode contacting the earth electrolyte. Determination of this voltage is to be made with the protective current applied to the structure pipeline for a minimum of 1/2 hour. Voltage drops must be considered for valid interpretation of this voltage drop consideration shall be identified by the Contractor's corrosion engineer and approved by the Government corrosion engineer.
  2. A negative polarized potential of at least 850 millivolts as measured between the structure surface a saturated copper-copper sulfate reference electrode contacting the earth electrolyte. Determination of this voltage is to be made after the protective current has been applied to the structure pipeline for a minimum of 1/2 hour.
  3. A minimum polarization voltage shift of 100mV measured between the structure surface and a saturated copper-copper sulfate reference electrode contacting the earth electrolyte. This voltage shift shall be determined by interrupting the protective current and measuring the polarization decay. At the instant the protective current is interrupted ("instant off"), an immediate voltage shift will occur. The voltage reading just after the immediate shift shall be used as the base reading from which to measure the polarization decay. The polarization decay shall be the difference between the base reading and a voltage measurement made 1/2 hour after the interruption of protective current.

### 3.3 DEMONSTRATION

- A. Instructing Government Personnel: During the warranty testing and at a time designated by the Contracting Officer, make available the services of a technician regularly employed or authorized by the manufacturer of the Cathodic Protection System for instructing Government personnel in the proper operation, maintenance, safety, and emergency procedures of the Cathodic Protection System. The period of instruction shall be not less than one 8-hour working days. Conduct the training at the jobsite or at another location mutually satisfactory to the Government and the Contractor. The field instructions shall cover all of the items contained in the operation and maintenance manual

### 3.4 SCHEDULE

- A. Some metric measurements in this section is based on a mathematical conversion of an English unit measurement, and not on metric measurement commonly agreed upon by the manufacturers or other parties. The English and metric units for the measurements shown are as follows:
  - 1. Reference Electrodes:
    - a. Diameter: 1-1/4 inches
    - b. Length: 10 inches
  - 2. Warning Tape:
    - a. Width: 3 inches

END OF SECTION

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## SECTION 16710

### COMMUNICATIONS CIRCUITS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. For Minuteman Site, contractor shall coordinate and arrange with the local Telecommunications and CATV Utility Companies for provision~~ing~~ of telecommunication and CATV service distribution and building entrance service. The local utility companies will provide network interface devices (NID) as points of demarcation at each living unit. The Contractor shall provide interior terminating devices, outlets, premises wiring and accessories.
- B. For Matador Site, contractor shall coordinate and arrange with the local Telecommunications and CATV Utility Companies for provision of telecommunications and CATV service distribution and building entrance service. The local utility companies will provide network interface devices (NID) as points of demarcation at each living unit. The contractor shall provide interface devices and interior terminating devices, outlets, premises wiring and accessories.

##### 1.2 REFERENCES

- A. TIA/EIA 568 – B.1 (Telecommunications Industries Association/Electronic Industries Association) - Commercial Building Telecommunications Cabling Standard Part 1: General Requirements
- B. TIA/EIA 568 – B.2 (Telecommunications Industries Association/Electronic Industries Association) - Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling
- C. TIA/EIA 569 A (Telecommunications Industries Association/Electronic Industries Association) - Commercial Building Standard for Telecommunications Pathways and Spaces.
- D. Department of Defense (DOD) - Air Force Family Housing Guide.
- E. NFPA 72 – National Electrical Code (NEC)

##### 1.3 SYSTEM DESCRIPTION

- A. For Minuteman Site: The Telecommunications and CATV Utility Companies shall provide telephone and CATV service distribution, building entrance cables, and network interface devices.
- B. For Matador Site: The Telecommunications and CATV Utility Companies shall provide telephone and CATV service distribution, building entrance cables and network interface devices.

- C. The local Telecommunications Utility Company is Qwest.
  - 1. Contact: Butch Preston, OSP Engineer, 406-771-2533
  - 2. Contact: Scott Cleveland, Cable Maintenance Foreman, 406-771-2585
  
- D. The local CATV Utility Company is AT&T Broadband.
  - 1. Contact: Henry Woloszyn, OSP Engineer, 406-727-8881
  - 2. Contact: Paul Gay, Construction Mgr., 406-727-8881
  
- E. Service Entrance Pathway:
  - 1. For Minuteman Site: All service entrance pathway up to building entrance service will be by Telephone and CATV Utility.
  - 2. For Matador Site: Provide empty raceway from point of connection to Telephone and CATV Utility provided pedestals to the building entrance service NIDs.
  
- F. Entrance Wiring: By Telephone and CATV Utility Companies.
  
- G. Horizontal Pathway: Comply to TIA/EIA 569-A and 570-A, using concealed pathways and/or raceway as required.
  
- H. Horizontal Wiring: Provide home runs from each utility's respective NID to each outlet, using unshielded and coaxial horizontal cables.
  - 1. Telecommunications: 4-pair, Category 5, unshielded twisted pair (UTP), UL Listed as required in the NEC as suitable for use in residential housing.
  - 2. CATV: Coaxial cable UL Listed as required in the NEC as suitable for use in residential housing.
  
- I. Outlet Devices And Faceplates: Provide outlet devices at locations indicated on contract document drawings.

#### 1.4 SUBMITTALS

- A. Comply with requirements of Section 01330 – Submittal Procedures.
  
- B. Product Data: Submit catalog data for each termination device, cable, faceplate and outlet device.
  
- C. Test Reports: Document and provide procedures and results for specified field-testing and inspection.

#### 1.5 CLOSEOUT SUBMITTALS

~~A. Comply with requirements of Section 01780 – Closeout Submittals.~~ Section 01702 – As Built Records and Drawngs.

B.A. Project Record Documents: Record and submit actual locations, quantities, and sizes of outlet devices.

## 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years experience.
- B. Installer: Company specializing in installing products specified in this section with minimum five years experience.
- C. Testing Agency: Company specializing in testing products specified in this section with minimum five years experience.

## PART 2 - PRODUCTS

### 2.1 TELEPHONE PULL BOX ENCLOSURE AND CATV PULL BOX ENCLOSURE

- A. NEMA Type 3/3R enclosure, 12 inches by 12 inches by 6 inches with removable cover. Provide knockouts in the field.
- B. Acceptable Manufacturer:
  - 1. Circle AW Part No. 12126 RTSC NK.
  - 2. Or approved equivalent.

### 2.2 OUTLET DEVICES AND FACEPLATES

- A. General:
  - 1. Provide angled down outlet connection devices for both telephone and CATV.
- B. Telephone:
  - 1. Provide one 8-position, 8-pin, angled down, Category 5, outlet connector jack color electrical ivory to match electrical cover plates.
  - 2. Wire all outlet connector jacks to TIA/EIA Standard T568A pin-out.
  - 3. Acceptable manufacturers:
    - a. AVAYA Communications.
    - b. NORDX/CDT.
    - c. Siemon.
    - d. Or approved equivalent.
- C. Telephone (wall mounted):
  - 1. Provide one 8-position, 8-pin, outlet connector jack in a stainless steel faceplate equipped with two, wall telephone, slotted, mounting posts.
  - 2. Provide at locations indicated on the Drawings.
  - 3. Wire the outlet connector jack to TIA/EIA Standard T568A pin-out.
  - 4. Typical part number is 630B-8.
  - 5. Acceptable manufacturers:
    - a. AVAYA Communications.
    - b. AllenTel.
    - c. Or approved equivalent.

D. CATV:

1. Provide one "F" type, angled down, coaxial coupler (barrel) connector device for each TV location indicated on drawings.
2. Match CATV faceplate color to that of telephone and electrical cover plates, electrical ivory.
3. Acceptable manufacturers:
  - a. AVAYA Communications.
  - b. NORDX/CDT.
  - c. Siemon.
  - d. Or approved equivalent.

2.3 COAXIAL CABLE CONNECTORS

- A. Provide an "F" type, male, connector for each CATV drop at the outlet end.
- B. Connect the coaxial cable to the outlet device using the "F" type connector provided.

2.4 HORIZONTAL CABLE

A. Telephone:

1. Provide UL Listed Category 5, unshielded twisted pair (UTP), 100-ohm, 24 AWG copper, 4-pair cable home run for each telephone outlet indicated on the drawings.
2. Comply with TIA/EIA Standards 568-A, 569-A, 570-A, and the NEC.
3. Acceptable manufacturers:
  - a. AVAYA Communications.
  - b. NORDX/CDT.
  - c. CommScope
  - d. Berk-Tek
  - e. Or approved equivalent.

B. CATV:

1. Provide UL Listed foam polyethylene dielectric RG-6 Series, 77 percent shielded, tri-shield PVC jacketed, NEC rated CATV coax cable home run for each TV outlet indicated on the drawings.
2. Comply with TIA/EIA Standards 568-A, 569-A, 570-A, and the NEC.
3. Acceptable manufacturers:
  - a. CommScope, F677TSV V
  - b. Or approved equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide pathways in accordance with TIA/EIA Standards 569-A, 570-A, and the NEC.
- B. Provide wire and cable in accordance with TIA/EIA Standards 568-B.1 and B.2, 570-A, and the NEC.

- C. Provide outlet boxes, mud rings, and enclosures plumb and level, and attach securely to building structure.
- D. Install recessed boxes and mud rings flush with wall finishes.
- E. Install polyethylene pulling string in each empty telephone and CATV utility conduit over 10-feet in length or containing any bends.
- F. Provide "F" type connectors at the outlet end of all coaxial cables and connect to the faceplate coax coupler (barrel) connector.
- G. Terminate 4-pair UTP cables to the telecommunications outlet connector jacks using TIA/EIA Standard T568A pin-out.
- H. Home run all telecommunications and CATV cables from their outlet location to the demarcation point of connection provided by Qwest and AT&T Broadband. Coordinate with the both utilities for location and the amount of excess cable to leave at the demarcation point of connection.
- I. Direct Qwest to connect all telecommunications cables at the NID in the following manner:
  - 1. Connect the blue-white pair to the first pair in the buried service wire provided by Qwest.
  - 2. Connect the orange-white pair to the second pair in the buried service wire provided by Qwest.
  - 3. Connect all horizontal cables at the NID so the tenant can plug a phone into any outlet and that outlet will be activated.
- J. Direct AT&T Broadband to connect all CATV cables at the point of demarcation so that all horizontal cables will be active at their respective CATV outlet.

### 3.2 FIELD QUALITY CONTROL

- A. AT&T Broadband is responsible for the proper signal level at the outlet connector device where the tenant's receiver is connected.
- B. Test 4-pair copper cables in accordance with TIA/EIA 568-A Standards for Category 5 for the permanent link test. Provide documented results to the Base Communications Squadron for approval.
- C. Repair to the Base Communications Squadron's satisfaction any wire runs that fail the permanent link test or otherwise deemed non-compliant.

END OF SECTION

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