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**PROJECT NUMBER: W9124L-25-R-RR11**

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## SECTION 01 10 00 SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. The work to be performed under this project consists of providing the labor, equipment, and materials to complete the work for Repair Underground Feeder 5B as described in drawings, specifications and contract documents.
- B. The work includes incidental related work.

#### 1.2 LOCATION OF WORK

Work is located at Fort Sill, Oklahoma.

#### 1.3 PRINCIPAL FEATURES

- A. Demolition:
  - (1) Remove and replace existing underground high voltage cables and cable racks as indicated on the drawings.
  - (2) pump water out of existing manholes.
  - (3) Clean and dry existing conduits before installing new cables in existing conduits.
- B. New Work:
  - (1) Provide new high voltage cables and cable racks and other associated items in accordance with the drawings and specifications.
- C. Incidentals: The foregoing outline of principal features does not limit the responsibilities of the Contractor to perform all work and furnish all materials required by the drawings and specifications and to perform other work items that may be required or associated with this type of work.
- D. Government Furnished Equipment and/or Material: NONE.
- E. Hot Work Permit: the contractor shall request a hot work permit for the project.

#### 1.4 CONTRACT DRAWINGS

- A. The following drawings form a part of this contract.

<u>Title</u>	<u>Drawing No.</u>
Location Map and Drawing Index	25011-a
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- B. One electronic set of contract drawings and specifications will be furnished to the Contractor. Hard copy of contract drawings will not be furnished. Reference publications will not be furnished.
- C. Contractor shall immediately check furnished drawings and notify the Government of any discrepancies.
  - a. Record drawings of past work performed on the applicable facility may be on file at the Directorate of Public Works, Engineering Division, building 1950, and are available for review by the offerors during normal business hours. Copies will not be provided upon request. The Government assumes no responsibility for any deductions or conclusions made from record drawings. Proposals shall be based upon data obtained through contractor's field verification of existing conditions at the facility where work is to be performed.

## 1.5 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK

- A. The Contractor will be required to commence work under this contract 10 calendar days after the date of receipt by him of notice to proceed, to prosecute said work diligently, and to complete the entire work ready to use no later than 94 calendar days after the date of receipt by him of notice to proceed. The time stated for completion shall include 5 weather days, receipt of approved As-Built drawings, receipt of approved Operation and Maintenance manuals, all final close out documents, mobilization and final clean up.
- B. The Contractor will be required to submit a Payment Estimate – Contract Performance Statement, Fort Sill Form 94, in accordance with base specification section 01 32 00. Close out documents, to include As-Built Drawings and Operations and Maintenance (O&M) Manuals shall be indicated as 15% of the job in section 11b.1 of FS Form 94. Liquidated Damages will be assessed if close out documents are not received and approved by the Government with the time period stated herein.

## 1.6 OPERATIONS SECURITY

- A. Per AR 530-1 Operations Security, the contractor employees must complete Level I OPSEC Awareness training. New employees must be trained within 30 calendar days of their reporting for duty and annually thereafter.

END OF SECTION

## SECTION 01 14 00

### WORK RESTRICTIONS

#### PART 1 - GENERAL

##### 1.1 REFERENCES

- A. 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.
- B. U.S. ARMY CORPS OF ENGINEERS (USACE) EM 385-1-1 Safety and Health Requirements Manual

##### 1.2 MEASUREMENT AND PAYMENT

- A. Payment for work under this contract and all costs associated shall be included in the applicable bid item to which the work pertains.

##### 1.3 ASSIGNMENT OF WORK

- A. Work will be assigned by the Contracting Officer only and will be in writing.

##### 1.4 EXISTING WORK

- A. Protect existing vegetation, structures, equipment, utilities, pavement and improvements. Remove or alter existing work in such a manner as to prevent injury or damage to any portions of the existing work to remain or to be reused.
- B. Repair or replace portions of existing work that has been altered during construction operations to match existing or adjoining work, as approved by the Contracting Officer. At the completion of operations, existing work shall be in a condition equal to or better than that which existed before new work started.

##### 1.5 INSPECTION OF WORK

- A. Technical surveillance of workmanship and inspection of materials for work being performed for this project shall be the responsibility of the Directorate of Public Works.

- B. This provision in no way authorizes anyone other than the Contracting Officer to commit the government to changes in the terms of the contract. (FAR Clause 52.246-12)

## 1.6 SUBMITTALS

- A. Provide submittals as required by the Contract specifications in accordance with specification section 01 33 00. Provide a submittal register for review and approval. The submittal register, 25-011 SUBMITTAL REGISTER, an Excel Spreadsheet used in addition to ENG Form 4288-R, is attached. The submittals listed on the submittal register may not be all inclusive and any submittal required in the specifications but not shown on this list is still a requirement of this Contract. Submittal due dates are provided on the SUBMITTAL REGISTER. Provide submittal information to the Contracting Officer's Representative.
- B. Government approval of submittals does not relieve the Contractor from providing all work in compliance with the contract.
- C. As-Built Drawings: All sheets in the As-Built drawing set shall be dated and marked "As-Built". As-Built drawings shall reflect the actual as-built construction. The one-half size hard copy and two electronic copies of the As-Built drawings shall be submitted to the Contracting Officer. The electronic copies shall be in PDF format and a format editable by MicroStation. The As-Built drawings are required for all specification sections whether or not specifically indicated in each individual section. The drawings shall be in accordance with AEC CAD Standard.

## 1.7 OCCUPANCY OF PREMISES

- A. Before work is started, the Contractor shall arrange with the Contracting Officer a sequence of procedure, means of access, and space for storage of materials.
- B. Coordination and notification of commencement of work shall be given to the appropriate building occupants a minimum of two weeks prior to beginning work in the affected areas with approval through the Contracting Officer.
- C. The Contractor shall provide signs, barriers, and barricades to provide a safe work area and protect building occupant entry and egress.

## 1.8 ACCESS TO FORT SILL

A. Contractor Access to Fort Sill: Effective 30 January 2015, personnel requiring access to the installation shall possess a Long Term Unescorted Access Pass or Military ID, or Individual temporary pass issued by the Fort Sill Directorate of Emergency Services (DES) pursuant to Army Directive 2014-05, Policy and Implementation Procedures for Common Access Card Credentialing and Installation Access for Un-cleared Contractors. Fort Sill has initiated a system which provides two forms of access documentation based upon the duration of required access and DOD Network requirements. The two forms are as follows: (1) Long Term Unescorted Access Pass or Military ID; or an (2) Individual Temporary Pass. The Contractor shall provide the COR the required documentation for each prime or sub-contract employee who requires a Long-Term Unescorted Access Pass as described below within 10 calendar days of contract award. The COR will initiate and coordinate the process for obtaining Contractor Long Term Unescorted Passes (for contract employees not possessing a current military ID) with the Directorate of Emergency Services (DES). Failure to receive a Long-Term Unescorted Access Pass or Individual Temporary Pass will result in the contractor personnel being denied admission to the installation.

1. Long Term, Unescorted Access Pass: This pass is required for Contractors, Sub-contractors and Vendors requiring physical access to the installation on a recurring basis (greater than 24 hours) and who do not require access to a DOD computer network. The expiration date of the access will be the end of the contract period of performance or 365 day whichever comes first. Sub-contractors shall be bound by this same requirement. Prime Contractors are responsible for obtaining timely sub-contractor documents necessary to secure required access documents. Contractors and their employees shall pass a NCIC Interstate Identification Index check in order to secure this pass.
  - a. Military ID: Military ID cards for retirees, reservists and dependents are acceptable for unescorted access onto Fort Sill.
  - b. To avoid delays in gaining access to the installation, contractors are encouraged to contact their Contracting Officer Representative (COR) to begin the process of securing long term passes as soon as possible.
2. Individual Temporary Pass: All contractors and sub-contractors who do not possess a CAC, a valid Military ID, or a current long term unescorted pass shall report to the Visitors Control Center located near Sheridan gate to obtain an Individual temporary pass. A temporary pass will ONLY be issued to persons who produce a valid current federal or state issued ID with a picture and passes a NCIC Interstate Identification Index check and local exclusion roster. Acceptable forms of ID are:

- a. ID cards for installation access must be REAL ID Act compliant.
  - b. Valid current Permanent Resident Card or Alien Registration Receipt Card (Form I-551)
  - c. Valid current Employment Authorization Document (Card) that contains a photograph (Form I-766)
  - d. Passport (Foreign Passports must show point of entry stamp).
3. The contractor shall return issued Passes to the designated COR at the end of the contract period of performance or the end of the individual employee's tenure, whichever comes first. The contractor shall also coordinate with the COR for new or replacement Long Term Unescorted Passes as required.
4. For additional information, see:
- a. <https://sill-www.army.mil/vcc/>
  - b. <https://sill-www.army.mil/USAG/forms.html>
  - c. Fort Sill unescorted access regulation (to be published).
  - d. Homeland Security Presidential Directive 12, Policy for a Common Identification Standard for Federal Employees and Contractors located at <https://www.dhs.gov/homeland-security-presidential-directive-12#1>
  - e. Army Regulation (AR) 190-13, the Army Physical Security Program located at <https://www.irp.fas.org/doddir/army/ar190-13.pdf>

## 1.9 ACCESS TO SITE

- A. Normal duty hours for work shall be from 7:30 a.m. to 4:00 p.m., Monday through Friday. Access to the site shall be coordinated and approved by the Contracting Officer.
- B. Requests for additional work periods shall require written approval from the Contracting Officer 7 days in advance of the proposed work period. Weekend work requests may be approved on a case-by-case basis on the Wednesday prior to the desired weekend.

## 1.10 DEFINITIONS



- A. Whenever the specifications require approval or selection of any item, it shall be construed to mean approval or selection by the Contracting Officer in writing.
- B. Whenever the specifications require submittal of reports or certifications, it shall be construed to mean submitted to the Contracting Officer in writing.
- C. Approvals made by the Contracting Officer prior to final project inspection and acceptance do not relieve the Contractor from his obligation to perform the work in accordance with the specifications and drawings. These approvals do not prohibit the Government from subsequently asserting any other contract rights under this contract.

#### 1.11 SAFETY

- A. Requirements of EM 385-1-1 shall be strictly enforced and adhered to at all time at the job sites.
- B. The contractor shall adhere to the requirements of the Occupational Safety and Health Administration as applicable to all work activities.
- C. Each contractor shall have a properly trained Safety Officer (OSHA 30-hour Construction) who is responsible for the overall safety program for the company. The Safety Officer shall be familiar with the requirements of EM385-1-1 and have experience in the areas of hazard identification and safety compliance. The Safety Officer shall make regular (minimum of 1 per week) safety inspections of each project site.
- D. When working within six feet of any railroad track, the contractor shall ensure that all workers are trained in Blue Flag Protection in accordance with CFR49, part 218, the General Code of Operating Rules (GCOR), 5.13 and TM 4-14.21 Rail Safety; and are qualified on Roadway Worker Protection in accordance with CFR49, part 214.

#### 1.12 SEQUENCING AND SCHEDULING

- A. Contractor shall furnish the Contracting Officer a Contract Progress Schedule in the form of a Gantt chart that clearly shows the critical path for construction progress prior to issuance of the Notice to Proceed. See section 01 33 00 SUBMITTAL PROCEDURES for a detailed description of the Progress Schedule. The Progress Schedule shall include, but is not limited to, the following information:

1. Projected dates of the start and completion of work.
2. Projected start and completion dates of each major phase of construction.
3. Major submittals and submittal processing time.
4. Major equipment lead time.

B. Changes to the Progress Schedule shall be submitted by the Contractor to the Contracting Officer, in writing, two weeks prior to the scheduled start of the affected work on the job sites, or as directed by the Contracting Officer.

### 1.13 UTILITIES

A. All reasonable amounts of water, electricity, and gas required for the performance of the work under this contract will be made available to the Contractor by the Government from existing distribution systems at no cost to the Contractor.

B. Connection and disconnection shall be the responsibility of the contractor.

C. Connection and disconnection shall be made in a manner approved by the Government.

D. Abuse of this policy may result in disconnection from utilities.

E. Contractor shall submit an energy and water conservation plan prior to issuance of the Notice to Proceed.

1. The plan shall outline all expected activities that will consume water, electricity, and natural gas along with estimates of consumption.
2. Plan shall outline a plan to install any and all necessary meters (i.e. job trailers or buildings unoccupied with exception of the contractor). It shall include a detailed map showing the location of the meters. Contractor shall install all meters for temporary utility hookups.
3. All meters shall comply with all local codes and regulations and will include any additional equipment necessary such as backflow preventers. Contractor shall remove all temporary meters and equipment when project is completed.
4. Plan shall describe effort to comply with reporting standards stated herein.
5. Plan must demonstrate efforts to conserve electricity, natural gas and water in compliance with Ft. Sill policies and best management practices on conservation of electricity, natural gas, and water.

6. If there is a change in the project that will or may change the utility connection requirements, the Contractor shall submit a revised compliance plan to the Contracting Officer.
7. Contractor shall sign and return to the Contracting Officer a Memorandum of Understanding for Sale of Utility Services (DA2100-R) before utilities will be turned on.
8. Contractor shall report meter readings to the Contracting Officer or the Contracting Officer's Representative on the 15th of each month or immediately upon disconnection of utilities.
9. Meter readings shall be reported from the beginning of the construction to the completion of construction. This requirement includes recording meter readings from water points on post. The meter reading reports shall include project name and contract number.

#### 1.14 SALVAGE MATERIAL AND EQUIPMENT

- A. No salvage is required.

#### 1.15 CLEAN UP

- A. The job site shall be cleaned up on a daily basis.
- B. All trash and debris, except metal, generated from the construction operation shall be delivered to the Fort Sill sanitary landfill or rubble pit as directed by the Contracting Officer.
- C. All metal shall be disposed off Government property.
- D. No material shall be burned at the project site. (FAR Clause 52.236-12)

#### 1.16 CONDUCT OF EMPLOYEES

- A. The Contractor's employees shall not be permitted to carry firearms or other lethal weapons while on Fort Sill in accordance with Fort Sill Regulation 190-1. Knives or other bladed instruments or tools are authorized for use only for the utilitarian purpose for which it was designed.
- B. The contractor and the contractor's employees shall adhere to the United States Army's Sexual Harassment/Assault Response Prevention (SHARP) policies and regulations in addition to state and federal laws.
  1. Army's Policy on sexual harassment

- a. Sexual harassment is unacceptable and will not be tolerated.
- b. Sexual harassment destroys teamwork and negatively affects combat readiness.
- c. Army leadership at all levels will be committed to creating an environment conducive to maximum productivity and respect for human dignity.
- d. The success of the mission can be achieved only in an environment free of sexual harassment for all personnel.
- e. The Army's SHARP policies apply without regard to a person's rank, age, gender, and are sexual orientation neutral. A person's sexual orientation is a personal and private matter.

2. Army Policy on Sexual Assault

- a. Sexual assault is a criminal offense.
- b. It degrades mission readiness.
- c. Soldiers and civilians who are aware of a sexual assault incident should report it immediately (within 24 hours).
- d. Sexual assault is incompatible with Army Values and is punishable under the UCMJ and other federal and local civilian laws.
- e. The Army's SHARP policies apply without regard to a person's rank, age, gender and sexual orientation neutral. A person's sexual orientation is a personal and private matter.
- f. All victims of sexual assault will be treated with dignity, fairness, and respect.

3. SHARP Contact information

- a. 911
- b. Department of Defense Safe Helpline (<https://www.safehelpline.org/>) Helpline: 1-877-995-5247
- c. RAINN (Rape, Abuse, and Incest National Network, <https://www.rainn.org/>) National Sexual Assault Hotline: 1-800-656-HOPE (4673)
- d. Oklahoma Coalition Against Domestic Violence and Sexual Assault (<https://www.ocadvsa.org/>) Oklahoma Safe line: 1-800-522-7233
- e. Sexual assault victim advocate and counseling available FREE of charge. <https://www.mariedetty.com/> Hotline: (580) 357-2500 Office: (580) 357-6141

4. References

- a. 29 CFR Part 1614
- b. AR 600-20
- c. AR 690-600
- d. Title 42 United States Code Chapter 21 Subchapter VI

1.17 WORK FORCE

- A. The contractor shall not hire persons not legally residing in the United States. The contractor shall not subcontract work to companies that hire persons not legally residing in the United States.

#### 1.18 IDENTIFICATION OF CONTRACTOR EMPLOYEES AND VEHICLES

- A. Each side of Contractor-owned vehicles shall bear the Contractor's name in 2-inch letters.
- B. Each Contractor employee shall possess an identification card to include employee's name, name of Contractor, current photo, and card serial number. Additionally, each Contractor employee shall display on his/her person a badge or nametag which shall include the name of the employee and the Contractor's name.
- C. The Contractor shall collect Contractor-furnished identification badges upon termination of employee.

#### 1.19 APACHE GATE DELIVERY INFORMATION

- A. All delivery trucks, transportation trucks, vehicles pulling trailers, every type of cargo or construction vehicle must enter through Apache Gate. Location of Apache Gate: Take the Medicine Park exit 45 off Interstate 44, proceed west on highway 49 (approximately 1/2 mile). Entrance to Apache Gate is on the left (south).

#### 1.20 ANTITERRORISM (AT)

- A. Access and General Protection/Security Policy and Procedures: Contractor and all associated sub-contractors' employees shall comply with applicable installation, facility, and area commander installation/facility access and local security policies and procedures (provided by government representative). The contractor shall also provide all information required for background checks to meet installation access requirements to be accomplished by installation Provost Marshal Office, Director of Emergency Services, or Security Office. Contractor workforce must comply with all personal identity verification requirements as directed by DOD, HQDA, and/or local policy. In addition to the changes otherwise authorized by the changes clause of this contract, should the Force Protection Condition (FPCON) at any individual facility or installation change, the Government may require changes in contractor security matters or processes.

- B. The Contractor must pre-screen Candidates using the E-verify Program (<https://www.uscis.gov/e-verify>) website to meet the established employment eligibility requirements. The Vendor must ensure that the Candidate has two valid forms of Government issued identification prior to ensure the correct information is entered into the E-verify system. An initial list of verified/eligible Candidates must be provided to the COR no later than 3 business days after the initial contract award.
- C. All contractor employees, to include subcontractor employees, requiring access to Army installations, facilities, and controlled access areas shall complete AT Level I awareness training within 30 calendar days after contract start date or effective date of incorporation of this requirement into the contract, whichever is applicable. The contractor shall submit certificates of completion for each affected contractor employee and subcontractor employee to the COR or to the KO, if a COR is not assigned within 10 calendar days after completion of training by all employees and subcontractor personnel. AT level I awareness training is available at the following website:  
<https://jko.jten.mil/courses/AT-level1/launch.html>
- D. The contractor and all associated sub-contractors shall brief all employees on the local iWATCH program (training standards provided by the requiring activity ATO). This locally developed training will be used to inform employees of the types of behavior to watch for and instruct employees to report suspicious activity to the COR. This training shall be completed within 30 calendar days of contract award and within 14 calendar days of new employees commencing performance with the results reported to the COR NLT 35 calendar days after contract award. This training may be accomplished by viewing the video at the following website:  
<https://www.youtube.com/embed/vlzYhQp7fPw>

PART 2 - PRODUCTS  
NOT USED

PART 3 - EXECUTION  
NOT USED

-- END OF SECTION --

## **SPECIFICATIONS**

### **REPAIR UNDERGROUND FEEDER 5B**

#### **TOC 25-011**

## **SECTION 16375**

### **ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND**

#### **PART 1 GENERAL**

##### **1.1 SUBMITTALS**

The following shall be submitted:

Manufacturer's Catalog Data;

Catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

Material, Equipment, and Fixture Lists;

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each such item.

Installation Procedures;

As a minimum, installation procedures for medium-voltage cable terminations and splices.

Procedures shall include cable pulling plans, diagrams, instructions, and precautions required to install, adjust, calibrate, and test the devices and equipment.

##### **SD-04 Drawings**

Electrical Distribution System;

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams manufacturers standard installation drawings and other information necessary to define the installation and enable the Government to check conformity with the requirements of the contract drawings.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures shall be included with the detail drawings. Approved departures shall be made at no additional cost to the Government.

Detail drawings shall show how components are assembled, function together and how they will be installed on the project. Data and drawings for component parts of an item or system shall be coordinated and submitted as a unit. Data and drawings shall be coordinated and included in a single submission. Multiple submissions for the same equipment or system are not acceptable.

Detail drawings shall show physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit entrance, access requirements for installation and maintenance, physical

size, electrical characteristics, foundation and support details, and equipment weight. Drawings shall be drawn to scale and/or dimensioned.

#### As-Built Drawings;

The as-built drawings shall be a record of the construction as installed. The drawings shall include the information shown on the contract drawings as well as deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be a full sized set of prints marked to reflect deviations, modifications, and changes. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control representative and by the Contracting Officer prior to the submission of each monthly pay estimate. Upon completion of the work, the Contractor shall provide three full sized sets of the marked prints to the Contracting Officer for approval. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction. The Contractor shall correct and return the as-built drawings to the Contracting Officer for approval within 10 calendar days from the time the drawings are returned to the Contractor.

#### SD-09 Reports

##### Factory Test;

Certified factory test reports shall be submitted when the manufacturer performs routine factory tests, including tests required by industry standards. Results of factory tests performed shall be certified by the manufacturer, or an approved testing laboratory, and submitted within 7 days following successful completion of the tests. The manufacturer's pass-fail criteria for tests specified in paragraph FIELD TESTING shall be included.

##### Field Testing;

A proposed field test plan, 14 days prior to testing the installed system. No field test shall be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be performed, test equipment required, and tolerance limits.

##### Test Reports;

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of three rings, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The condition specified for the test.
- f. The test results, signed and dated.
- g. A description of adjustments made.



## Cable Installation Reports;

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of three rings from which material may readily be removed and replaced, including a separate section for each cable pull. Sections shall be separated by heavy plastic dividers with tabs, with all data sheets signed and dated by the person supervising the pull.

- a. Site layout drawing with cable pulls numerically identified.
- b. A list of equipment used, with calibration certifications. The manufacturer and quantity of lubricant used on pull.
- c. The cable manufacturer and type of cable.
- d. The dates of cable pulls, time of day, and ambient temperature.
- e. The length of cable pull and calculated cable pulling tensions.
- f. The actual cable pulling tensions encountered during pull.

## SD-13 Certificates

### Materials and Equipment;

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.

### Cable Splicer Qualification;

A certification that contains the names and the qualifications of people recommended to perform the splicing and termination of medium-voltage cables approved for installation 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 splicing and terminating the same or similar types of cables approved for installation. In addition, any person recommended by the Contractor may be required to perform a practice splice and termination, in the presence of the Contracting Officer, before being approved as a qualified installer of medium-voltage cables. If that additional requirement is imposed, the Contractor shall provide short sections of the approved types of cables along with the approved type of splice and termination kits, and detailed manufacturer's instruction for the proper splicing and termination of the approved cable types.

### Cable Installer Qualifications;

Contractor shall provide at least one onsite person in a supervisory position with a documentable level of competency and experience to supervise all cable pulling operations. A resume shall be provided showing the cable installers' experience in the last three years, including a list of references complete with points of contact, addresses and telephone numbers.

## SD-19 OPERATION AND MAINTENANCE MANUALS

### Electrical Distribution System;

Six copies of operation and maintenance manuals, within 7 calendar days following the completion of tests and including assembly, installation, operation and maintenance instructions, spare parts data which provides supplier name, current cost, catalog order number, and a recommended list of spare parts to be stocked. Manuals shall also include data outlining detailed procedures for system startup and operation, and a troubleshooting guide which lists possible operational problems and corrective action to be taken. A brief description of all equipment, basic operating features, and routine maintenance requirements shall also be included. Documents shall be bound in a binder marked or identified on the spine and front cover. A table of contents page shall be included and marked with pertinent contract information and contents of the manual. Tabs shall be provided to separate different types of documents, such as catalog ordering information, drawings, instructions, and spare parts data. Index sheets shall be provided for each section of the manual when warranted by the quantity of documents included under separate tabs or dividers.

Three additional copies of the instructions manual shall be provided within 30 calendar days following the manuals.

### 1.2 DELIVERY, STORAGE, AND HANDLING

Devices and equipment shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced.

### 1.3 EXTRA MATERIALS

Two complete sets of all special tools required for maintenance shall be provided, complete with a suitable tool box. Special tools are those that only the manufacturer provides, for special purposes (to access compartments, or operate, adjust, or maintain special parts).

## PART 2 PRODUCTS

### 2.1 STANDARD PRODUCT

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

### 2.2 NAMEPLATES

#### 2.2.1 General

Each major component of this specification shall have the manufacturer's name, address, type or style, model or

serial number, and catalog number on a nameplate securely attached to the equipment. Nameplates shall be made of noncorrosive metal.

## 2.3 CORROSION PROTECTION

### 2.3.1 Aluminum Materials

Aluminum shall not be used in contact with earth or concrete. Where aluminum conductors are connected to dissimilar metal, fittings conforming to UL 486B shall be used.

### 2.3.2 Ferrous Metal Materials

#### 2.3.2.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153/A 153M and ASTM A 123/A 123M.

## 2.4 CABLES

Cables shall be single conductor type unless otherwise indicated.

### 2.4.1 Medium-Voltage Cables

#### 2.4.1.1 General

Cable construction shall be Type MV, conforming to NFPA 70 and UL 1072. Cables shall be manufactured for use in duct or direct burial applications.

#### 2.4.1.2 Ratings

Cables shall be rated for a circuit voltage of 15 kV.

#### 2.4.1.3 Conductor Material

Underground cables shall be soft drawn copper complying with ASTM B 3 and ASTM B 8.

#### 2.4.1.4 Insulation

Cable insulation shall be ethylene-propylene-rubber (EPR) insulation conforming to the requirements of NEMA WC 8 and AEIC CS6. Cable shall be 133 percent insulation level.

#### 2.4.1.5 Shielding

Cables rated for 2 kV and above shall have a semiconducting conductor shield, a semiconducting insulation shield, and an overall copper tape shield for each phase.

#### 2.4.1.6 Jackets

Cables shall be provided with a PVC jacket.

## 2.5 CABLE JOINTS, TERMINATIONS, AND CONNECTORS

### 2.5.1 Medium-Voltage Cable Joints

Medium-voltage cable joints shall comply with IEEE Std 404 and IEEE Std 592. Medium-voltage cable terminations shall comply with IEEE Std 48. Joints shall be the standard products of a manufacturer and shall be either of the factory preformed type or of the kit type containing tapes and other required parts. Joints shall have ratings not less than the ratings of the cables on which they are installed. Splice kits may be of the heat-shrinkable type for voltages up to 15 kV, of the premolded splice and connector type, the conventional taped type, or the resin pressure-filled overcast taped type for voltages up to 35 kV. Joints used in manholes, handholes, vaults and pull boxes shall be certified by the manufacturer for waterproof, submersible applications.

### 2.5.2 Terminations

Terminations shall be as indicated on the drawing and in accordance with IEEE Std 48, and shall be 15 KV wet-process porcelain termination kits. Terminations shall be of the outdoor type. Terminations, where required, shall be provided with mounting brackets suitable for the intended installation and with grounding provisions for the cable shielding and metallic sheath.

## 2.6 CONDUIT AND DUCTS

Duct lines shall be concrete-encased, schedule 40 PVC conduits.

### 2.6.1 Nonmetallic Ducts

#### 2.6.2.1 Concrete Encased Ducts

### 2.6.3 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, or masonry; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

## 2.7 GROUNDING AND BONDING

### 2.7.1 Driven Ground Rods

Ground rods shall be copper-clad steel conforming to UL 467, and shall be 3/4 inch in diameter by 10 feet in length. Sectional type rods shall not be used.

### 2.7.2 Grounding Conductors

Grounding conductors shall be bare, except where installed in conduit with associated phase conductors. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Bare conductors shall be ASTM B 8 soft-drawn unless otherwise indicated. Aluminum is not acceptable.

## 2.8 CONCRETE

Concrete work shall have minimum 3000 psi compressive strength at 28 days.

## 2.9 CABLE FIREPROOFING SYSTEMS

Cable fireproofing systems shall be listed in FM P7825a as a fire-protective coating or tape approved for grouped electrical conductors and shall be suitable for application on the type of medium-voltage cables provided. After being fully cured, materials shall be suitable for use where exposed to oil, water, gases, salt water, sewage, and fungus and shall not damage cable jackets or insulation. Asbestos materials are not acceptable.

### 2.9.1 Fireproof Coating

Cable fireproofing coatings shall be compounded of water-based thermoplastic resins, flame-retardant chemicals, and inorganic noncombustible fibers and shall be suitable for the application methods used. Coatings applied on bundled cables shall have a derating factor of less than 5 percent, and a dielectric strength of 95 volts per mil minimum after curing.

### 2.9.2 Fireproofing Tape

Fireproofing tape shall be at least 2 inches wide and shall be a flexible, conformable, polymeric, elastomer tape designed specifically for fireproofing cables.

### 2.9.3 Plastic Tape

Pre-application plastic tape shall be pressure sensitive, 10-mil thick, conforming to UL 510.

## 3.4 CABLE RACKS

Cable racks shall be as shown on the drawings. Cable racks and supports shall be hot-dip galvanized steel. Cable racks shall be equipped with insulators. Insulators shall be made of high-glazed porcelain. The corners and edges of insulators shall be rounded.

## PART 3 EXECUTION

### 3.1 GENERAL INSTALLATION REQUIREMENTS

Equipment and devices shall be installed and energized in accordance with the manufacturer's published instructions. Steel conduits installed underground shall be installed and protected from corrosion.

#### 3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of NFPA 70 and IEEE C2 unless more stringent requirements are indicated or shown.

#### 3.1.2 Verification of Dimensions

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

## 3.2 CABLE INSTALLATION

The Contractor shall obtain from the manufacturer an installation manual or set of instructions which addresses such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, etc. The Contractor shall then prepare a checklist of significant requirements which shall be submitted along with the manufacturer's instructions in accordance with SUBMITTALS.

### 3.2.1 Cable Installation Plan and Procedure

Cable shall be installed strictly in accordance with the cable manufacturer's recommendations. Each circuit shall be identified by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, in each manhole, junction box, and each terminal. Each tag shall contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.

#### 3.2.1.1 Cable Inspection

The cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable in accordance with the cable manufacturer's recommendations.

#### 3.2.1.2 Duct Cleaning

Duct shall be cleaned with an assembly that consists of a flexible mandrel (manufacturers standard product in lengths recommended for the specific size and type of duct) that is 1/4 inch less than inside diameter of duct, 2 wire brushes, and a rag. The cleaning assembly shall be pulled through conduit a minimum of 2 times.

#### 3.2.1.3 Duct Lubrication

The cable lubricant shall be compatible with the cable jacket for cable that is being installed. Application of lubricant shall be in accordance with lubricant manufacturer's recommendations.

#### 3.2.1.4 Cable Installation

The Contractor shall provide a cable feeding truck and a cable pulling winch as required. The Contractor shall provide a pulling grip or pulling eye in accordance with cable manufacturer's recommendations. The pulling grip or pulling eye apparatus shall be attached to polypropylene or manilla rope followed by lubricant front end packs and then by power cables. A dynamometer shall be used to monitor pulling tension. Pulling tension shall not exceed cable manufacturer's recommendations. The Contractor shall not allow cables to cross over while cables are being fed into duct. For cable installation in cold weather, cables shall be kept at 50 degrees F temperature for at least 24 hours before installation.

#### 3.2.1.5 Cable Installation Plan

The Contractor shall submit a cable installation plan for all cable pulls in accordance with the detail drawings portion of paragraph SUBMITTALS. Cable installation plan shall include:

- a. Site layout drawing with cable pulls identified in numeric order of expected pulling sequence and direction of cable pull.
- b. List of cable installation equipment.

- c. Lubricant manufacturer's application instructions.
- d. Procedure for resealing cable ends to prevent moisture from entering cable.
- e. Cable pulling tension calculations of all cable pulls.
- f. Cable percentage conduit fill.
- g. Cable sidewall thrust pressure.
- h. Cable minimum bend radius and minimum diameter of pulling wheels used.
- i. Cable jam ratio.
- j. Maximum allowable pulling tension on each different type and size of conductor.
- k. Maximum allowable pulling tension on pulling device.

### 3.2.2 Duct Line

Cables shall be installed in duct lines where indicated. Cable splices in low-voltage cables shall be made in manholes only. Cable joints in medium-voltage cables shall be made in manholes only. Neutral conductors shall be installed in the same duct with their associated phase conductors.

### 3.2.3 Electric Manholes

Cables shall be routed around the interior walls and securely supported from walls on cables racks. Cable routing shall minimize cable crossover, provide access space for maintenance and installation of additional cables, and maintain cable separation in accordance with IEEE C2.

## 3.3 CABLE JOINTS

Medium-voltage cable joints shall be made by qualified cable splicers only. Qualifications of cable splicers shall be submitted in accordance with paragraph SUBMITTALS. Shields shall be applied as required to continue the shielding system through each entire cable joint. Shields may be integrally molded parts of preformed joints. Shields shall be grounded at each joint or in accordance with manufacturer's recommended practice. Cable joints shall provide insulation and jacket equivalent to that of the associated cable.

## 3.4 FIREPROOFING

Each medium-voltage cable and conductor in manholes shall be fire-proofed for their entire length within the manhole. Where cables and conductors have been lubricated to enhance pulling into ducts, the lubricant shall be removed from cables and conductors exposed in the manhole before fireproofing. Fire-stops shall be installed in each conduit entering or leaving a manhole.

### 3.4.1 Tape Method

Before application of fireproofing tape, plastic tape wrapping shall be applied over exposed metallic items such as the cable ground wire or metallic outer covering to minimize the possibility of corrosion from the fireproofing materials and moisture. Before applying fireproofing tape, irregularities of cables, such as at cable



joints, shall be evened out with insulation putty. A flexible conformable polymeric elastomer fireproof tape shall be wrapped tightly around each cable spirally in 1/2 lapped wrapping or in 2 butt-jointed wrappings with the second wrapping covering the joints of the first.

### 3.4.2 Sprayable Method

Manholes shall be power ventilated until coatings are dry and dewatered and the coatings are cured. Ventilation requirements shall be in accordance with the manufacturer's instruction, but not less than 10 air changes per hour shall be provided. Cable coatings shall be applied by spray, brush, or glove to a wet film thickness that reduces to the dry film thickness approved for fireproofing by FM P7825a. Application methods and necessary safety precautions shall be in accordance with the manufacturer's instructions. After application, cable coatings shall be dry to the touch in 1 to 2 hours and fully cured in 48 hours, except where the manufacturer has stated that because of unusual humidity or temperature, longer periods may be necessary.

## 3.5 DUCT LINES

### 3.5.1 Requirements

#### 3.5.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction.. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Existing ducts shall be thoroughly cleaned and dried before installing new cables.

### 3.5.3 Concrete Encasement

Ducts requiring concrete encasements shall comply with NFPA 70, except that electrical duct bank configurations for ducts 6 inches in diameter shall be as shown on the drawings. Duct line encasements shall be monolithic construction. Where a connection is made to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. The Contractor shall submit proposed bonding method for approval in accordance with the detail drawing portion of paragraph SUBMITTALS. At any point, tops of concrete encasements shall be not less than 24 inches below finished grade. Separators or spacing blocks shall be made of steel, concrete, plastic, or a combination of these materials placed not farther apart than 4 feet on centers. Ducts shall be securely anchored to prevent movement during the placement of concrete and joints shall be staggered at least 6 inches vertically.

### 3.5.4 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the manufacturer's recommendations for the particular type of duct and coupling selected and as approved.

#### 3.5.4.1 Plastic Duct

Duct joints shall be made by brushing plastic solvent cement on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick 1/4-turn twist to set the joint tightly.

### 3.5.5 Electrical warning tapes

Electrical warning tapes shall be provided for all underground circuits. A 5-mil brightly colored plastic tape, not less than 6 inches in width and suitably inscribed at not more than 10 feet on centers with a continuous



metallic backing and a corrosion-resistant 1-mil metallic foil core to permit for easy to locate the duct line, shall be placed approximately 12 inches below finished grade levels of trenches.

### 3.6 EXISTING MANHOLE

#### 3.6.1 General

Duct lines entering existing concrete manhole through a knockout penetration shall be grouted tight with a Portland cement mortar. PVC duct lines entering existing manhole through a PVC endbell shall be solvent welded to the endbell.

#### 3.6.2 Existing Electric Manholes

Cables shall be securely supported from walls by hot-dip galvanized cable racks and equipped with adjustable hooks and insulators. The number of cable racks shall be provided as indicated on the drawings and not less than 2 spare hooks shall be installed on each cable rack. Insulators shall be made of high-glazed porcelain. The corners and edges of insulators shall be round.

#### 3.6.3 Existing Ground Rods

Existing ground rod in existing manhole shall be connected to cable racks, cable-pulling irons, cable shielding, metallic sheath, and armor at each cable joint or splice by means of a No. 4 AWG braided tinned copper wire. Connections to metallic cable sheaths shall be by means of tinned terminals soldered to ground wires and to cable sheaths. Care shall be taken in soldering not to damage metallic cable sheaths or shields. Grounding electrode conductors shall be neatly and firmly attached to manhole walls and the amount of exposed bare wire shall be held to a minimum.

### 3.7 GROUNDING

Equipment frames of metal-enclosed equipment, and other noncurrent-carrying metal parts, such as cable racks, cable-pulling irons, cable shields, cable sheaths and metallic conduit shall be grounded.

#### 3.7.1 Grounding Electrodes

Grounding electrodes shall be installed as shown on the drawings and as follows:

- a. Driven rod electrodes - Unless otherwise indicated, ground rods shall be driven into the earth until the tops of the rods are approximately 1 foot below finished grade.
- b. Additional electrodes - When the required ground resistance is not met, additional electrodes shall be provided to achieve the specified ground resistance. The additional electrodes will be up to three 10-foot rods spaced a minimum 10 feet apart. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately.

#### 3.7.2 Grounding and Bonding Connections

Connections above grade shall be made by the fusion-welding process or with bolted solderless connectors, in compliance with UL 467, and those below grade shall be made by a fusion-welding process. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum

connectors suitable for this purpose shall be used.

### 3.7.3 Grounding and Bonding Conductors

Grounding and bonding conductors shall be not smaller No. 4 AWG bare copper wire and located to provide maximum physical protection. Bends greater than 45 degrees in ground conductors are not permitted. Routing of ground conductors through concrete shall be avoided.

### 3.7.4 Manhole Grounding

Ground rod installed in existing manhole shall be connected to cable racks, cable-pulling irons, the cable shielding, metallic sheath, and armor at each cable joint or splice by means of a No. 4 AWG braided tinned copper wire. Connections to metallic cable sheaths shall be by means of tinned terminals soldered to ground wires and to cable sheaths. Care shall be taken in soldering not to damage metallic cable sheaths or shields. Ground rods shall be protected with a double wrapping of pressure-sensitive plastic tape for a distance of 2 inches above and 6 inches below concrete penetrations. Grounding electrode conductors shall be neatly and firmly attached to manhole walls and the amount of exposed bare wire shall be held to a minimum.

## 3.8 FIELD TESTING

### 3.8.1 General

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 14 days prior to conducting tests. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. All field test reports shall be signed and dated by the Contractor.

### 3.8.2 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

### 3.8.3 Ground-Resistance Tests

The resistance of each grounding electrode shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- a. Single rod electrode -25 ohms.

### 3.8.4 Medium-Voltage Cable Test

After installation and before the operating test or connection to an existing system, the medium-voltage cable

system shall be given a high potential test. Direct-current voltage shall be applied on each phase conductor of the system by connecting conductors as one terminal and connecting grounds or metallic shieldings or sheaths of the cable as the other terminal for each test. Prior to making the test, the cables shall be isolated by opening disconnecting equipment. The test shall be conducted with all splices, connectors, and terminations in place. The method, voltage, length of time, and other characteristics of the test for initial installation shall be in accordance with NEMA WC 7 or NEMA WC 8 for the particular type of cable installed and shall not exceed the recommendations of IEEE Std 404 for cable joints and IEEE Std 48 for cable terminations unless the cable and accessory manufacturers indicate higher voltages are acceptable for testing. Should any cable fail due to a weakness of conductor insulation or due to defects or injuries incidental to the installation or because of improper installation of cable, cable joints, terminations, or other connections, the Contractor shall replace cables at no cost to the government. Replaced cables shall be retested.

### 3.8.5 Pre-Energization Services

Calibration, testing, adjustment, and placing into service of the installation shall be accomplished by a manufacturer's product field service engineer or independent testing company with a minimum of 2 years of current product experience. The following services shall be performed on the equipment listed below. These services shall be performed subsequent to testing but prior to the initial energization. The equipment shall be inspected to ensure that installation is in compliance with the recommendations of the manufacturer and as shown on the detail drawings. Terminations of conductors at major equipment shall be inspected to ensure the adequacy of connections. Bare and insulated conductors between such terminations shall be inspected to detect possible damage during installation. If factory tests were not performed on completed assemblies, tests shall be performed after the installation of completed assemblies. Components shall be inspected for damage caused during installation or shipment to ensure packaging materials have been removed. Items for which such services shall be provided, but are not limited to, are the following:

- a. Cables

### 3.8.6 Operating Tests

After the installation is completed, and at such times as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the requirements herein. An operating test report shall be submitted in accordance with paragraph SUBMITTALS.

## 3.9 MANUFACTURER'S FIELD SERVICE

### 3.9.1 Onsite Training

The Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total of 8 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The course instruction shall cover pertinent points involved in operating, starting, stopping, and servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance operations.

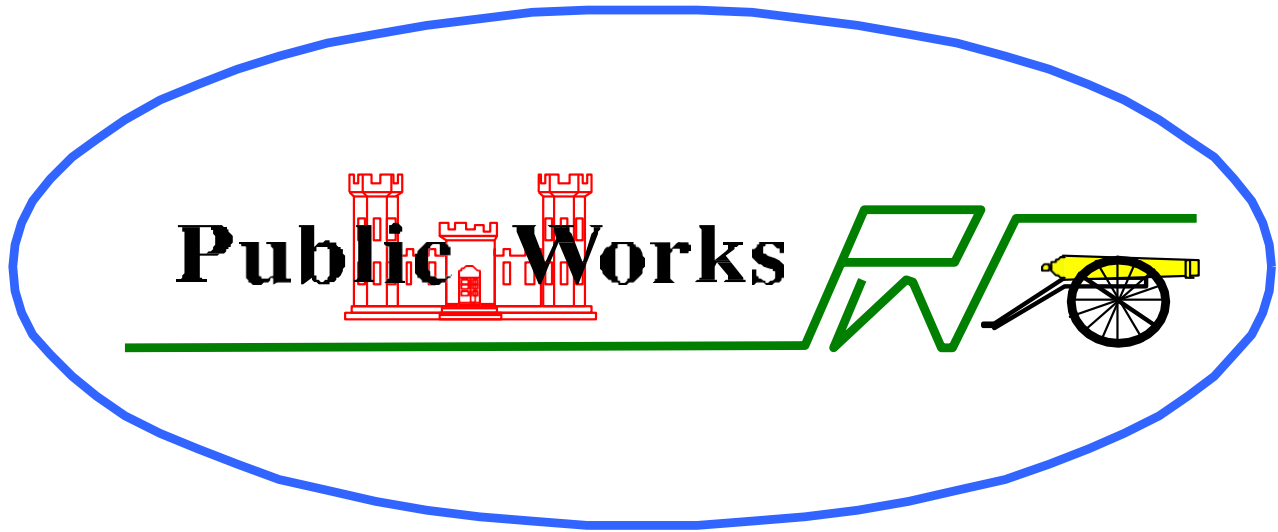
### 3.9.2 Installation Engineer

After delivery of the equipment, the Contractor shall furnish one or more field engineers, regularly employed by the equipment manufacturer to supervise the installation of the equipment, assist in the performance of the onsite tests, initial operation, and instruct personnel as to the operational and maintenance features of the equipment.

### 3.10 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

END OF SECTION



DIRECTORATE OF PUBLIC WORKS  
Fort Sill, Oklahoma  
Project requirements  
Updated: May 20, 2022

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## Section 26 00 01

### ELECTRICAL GENERAL REQUIREMENT

#### 1. General:

- (a) The Unified Facilities Criteria (UFC) system, the installation design guide and the most indicated stringent requirement shall be used as a guidance regarding the design and construction.
- (b) Provide details to show but not limited to transformers, pads, risers, trenching, lighting, pole details, controls, line diagrams etc.
- (c) As-built drawings: After completion of work, as built drawings red lines shall be provided electronically on CD to reflect as-built conditions after all related work are completed and shall be Micro Station "DGN" format, latest edition used by DPW.

#### 11 References

As a minimum, all electrical work performed on Fort sill shall conform to the latest edition of the following requirement, codes and standards:

- (1) NFPA 70, National Electrical Code (NEC)
- (2) NPFA 70E Standard for Electrical Safety in the Workplace
- (3) NFPA 72, National Fire Alarm and Signaling Code
- (4) IEEE C2, National Electric Safety Code (NESC)
- (5) UFC 3-501-01, Electrical Engineering
- (6) UFC 3-520-01, Interior Electrical Systems
- (7) UFC 3-530-01 Interior and Exterior Lighting and Controls
- (8) UFC 3-550-01, Exterior Electrical Power Distribution
- (9) UFC 3-560-01, Electrical Safety
- (10) UFC 3-575-01 Lightning and Static Electricity Protection Systems
- (11) UFC 3-600-01 Fire Protection Engineering for Facilities,
- (12) UFC 4-010-01, DOD Antiterrorism Standards for Buildings
- (13) UFC 4-021-1 Design and O&M: Mass Notification systems
- (14) NEIS, National Electrical Installation Standards
- (15) UFC-580-1 Telecommunications Building Cabling Systems Planning and Design
- (16) ANSIA/TIA/EIA-568-B
- (17) ANSIA/TIA/EIA-569-B

#### 12 Design

- (a) As a minimum, all electrical design shall conform to the latest edition of the above codes and standards.
- (b) To the extent possible, Unified Facility Guide Specifications (UFGS) and standard detail shall be utilized in the design. All specifications and general notes shall have the non-applicable parts edited.
- (c) Existing as-built drawings may be used as guidelines (if available). Information must be verified by field investigation. The Designer shall be responsible for the verification of

all dimensions, measurements, and location of existing facilities, utilities, equipment and other existing conditions that may affect the design.

(d) The following items shall be taken into consideration and included as part of the design analysis:

- (1) Exterior: Primary circuit availability and location.
- (2) Exterior: Primary circuit loading. Future loops may be designed for higher capacities as long as analysis shows that existing switchgear/substations can support the higher requirement.
- (3) Existing equipment age and condition, (equipment over 30 years in age must be updated to meet the current standards)
- (4) Transformer/panel board/switchgear loading (existing and future).
- (5) Non-linear loads (Fluorescent lighting, computers, variable frequency drives, etc)
- (6) Energy Analysis

(e) All new building wiring systems shall use three phase system, using 480/277V and, or 208/120V unless otherwise approved by DPW. Designer shall make recommendations of building voltages at the design analysis phase of each project.

### 13 Installation

- (a) As a minimum, all electrical installations shall conform to the latest edition of the above codes and standards.
- (b) Only state licensed journeymen electricians or a minimum 10 years of verifiable experience or registered apprentices under the direct supervision of journeymen will be permitted to install, alter, or repair electrical systems.
- (c) Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. All materials in the same category shall be by a single manufacturer. Refurbished or Discontinued product lines shall not be accepted.
- (d) All conductors shall be color-coded at panel boards, switchboard, terminations, junction boxes, manholes, hand holes, etc. Factory color-coding of insulation is preferred; however, colored tape may be used on current carrying conductors #6 and larger. Equipment grounding conductors (EGC) #6 and smaller must have factory color-coding of the insulation. A green equipment-grounding conductor shall be installed with all branch circuits. Circuit conductors shall be color coded as follows:
  - (1) All Configurations: Equipment Grounding Conductor, Green. (Exception: Where an isolated ground is required, the isolated ground shall be identified as green with a yellow stripe.)
  - (2) 120V, 2-wire circuit: Grounded conductor (neutral), White; Ungrounded leg, Black.
  - (3) 240/120V, 1-phase, 3-wire circuit: Grounded conductor (neutral), White; One

- hot leg, Black; One hot leg; Red.
- (4) 208Y/120V, 3-phase, 4-wire circuit: Grounded conductor (neutral), White; Phase A, Black; Phase B, Red; Phase C, Blue.
  - (5) 208V, 3-Phase, 3-wire circuit: Phase A, Black; Phase B, Red; Phase C, Blue.
  - (6) 480Y/277V, 3-phase, 4-wire circuit: Grounded conductor (neutral), Gray; Phase A, Brown; Phase B, Orange; Phase C, Yellow.
  - (7) 480V, 3-phase, 3-wire circuit: Phase A, Brown; Phase B, Orange; Phase C, Yellow.

## 1. ELECTRICAL DISTRIBUTION SYSTEM, AERIAL

1.1 Existing Medium Voltage (MV) distribution system is 13,200/7,620 Volt, 3-phase, 4 wires, multi-grounded system installed on wood poles and/or underground. New work shall be required to be underground. Coordinate with DPW.

1.2 Transformers: Provide non-polychlorinated biphenyl transformer with a spare capacity of 20% minimum. Provide Delta-Wye connection system, primary voltage: 13,200V, Secondary voltage 480/277V, 208/120V, copper windings, Coordinate voltages with DPW.

1.3 Pole-mounted sectionalizing switches: Provide sectionalizers as needed, coordinate with source.

1.4 Provide Fault Current Analysis, Protective Device Fully Coordination Study, see section 16375 below

1.5 Bare medium-voltage line conductors: Provide Aluminum-Conductor-Steel-Reinforced, ACSR.

1.6 Insulated Medium-Voltage line conductors: Provide 15kV, ethylene-propylene-rubber (EPR), 133 percent insulation level, copper.

1.7 Wood poles: Provide pressure treated, with creosote. Poles shall be branded with information such as height-class, year-month made, etc (ANSI standard info), metal tag is not acceptable. Poles with transformers, cutout or any equipment must be provided with metal tags showing feeder No., pole number, fuse ratings, and other information, coordinate with DPW.

1.8 Guy assemblies: Provide where required zinc-coated steel, extra-high-strength, with 8 feet,  $\frac{3}{4}$ " diameter guy rods minimum. Provide yellow Guy marker, 2" diameter and 8' height minimum.

1.9 Provide Armless Construction, where single phase is used, prepare for 3-phase construction. Coordinate with DPW.



- 1.10 Guy assemblies: Provide zinc-coated steel, extra-high-strength, with 8 feet, ¾" diameter guy rods. Provide Guy marker, 2" diameter minimum where required.
- 1.11 Cutouts: Provide 15KV, type K fuse link.
- 1.12 Surge arresters: Provide for protection of aerial-to underground transitions, transformers and other equipment as required.
- 1.13 Air-break switches: Provide Gang operated switches Normally Open (NO) or Normally Closed (NC) switches to connect to other feeders as required.
- 1.14 Ground rod: Provide copper-clad steel not less than 3/4 inch in diameter by 10 feet in length. Ground rods must be driven into undisturbed earth, 2' minimum away from the pole edge, structure or concrete foundations. It is not acceptable to install rod in the hole with riser pole or driven into backfill
- 1.15 Provide Rigid Galvanized Steel Conduit for risers.
- 1.16 Provide Metal poles with velocity 100mph minimum at the base of the pole, 1.3 wind gust factor, height and drag factor as recommended by AASHTO LTS-4. Effective projected area of luminaries and other equipment shall be considered in the pole design. Calculation shall be provided to support the pole design. Chipped, scratched, stained or dented poles shall not be acceptable.
- 1.17 Ground conductor protection: Provide mower guard, 36" height minimum, above finished grade for all pole grounds protection.

## 2. SECTION: ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND

- 2.1 Provide Medium Voltage Cables, MV with concentric neutral, copper, 15 kV, EPR, 133% insulation level, with ozone/sunlight resistant PVC jacket approved for direct burial application:
  - (a) MV cables, Main primary distribution system loop feeders shall be 750Kcmil minimum, installed in 6" conduit. Cables shall be routed and racked inside manhole to allow the longest possible length of spare cable in each manhole possible (minimum of 1 full loop around the interior of the manhole).
  - (b) MV cables, Radial feeders shall be #2 AWG minimum. Cables shall be routed and racked inside manhole to allow the longest possible length of spare cable in each manhole possible (minimum of 1 full loop around the interior of the manhole).
  - (c) MV Power cable test: New or existing cables shall be tested before energizing, by using Very Low Frequency (VLF) conforming to IEEE documents - "IEEE Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems" and IEEE 400.2 "Guide for Testing of Shielded Power Cable

Systems using Very Low Frequency (VLF)". Test duration shall not be less than 45 minutes.

2.2 Low Voltage Cables, service entrance: Provide copper conductor with XLP or EPR insulation.

2.3 Cables in the same duct with MV cables shall have same type insulation

2.4 Concrete Encased Duct Bank:

(a) MV, Duct lines shall be thick-wall type, PVC SCH 40, concrete-encased in trench, installed at 36 inches minimum below grade to the top of conduit. Concrete encased conduits shall have minimum spacing between conduits as specified by the NEC and at least 3 inches of concrete protecting them on top, bottom, and sides. Bore under roads, provide Galvanized Rigid Steel conduit, PVC coated or provide PVC conduit-in-casing, with interlocking plastic spacers, Underground Devices Incorporated product or equal. Provide spare conduit of equal size.

(b) The top of the concrete encasement shall be at least 30" below finished grade level at all points.

2.5 Direct Buried conduit:

(a) Low Voltage, Duct lines shall be direct-burial, thick-wall type SCH 40 or SCH 80, Concrete encased if installed in vehicular traffic areas. Top of conduit shall be installed at a minimum depth of 24" below grade.

(b) Do not use PVC conduit in areas subject to physical damage, including but not limited to mechanical, electrical rooms, penetrating fire rated walls, floors or partitions.

2.6 All conduits that transitions from below to above grade shall be galvanized rigid steel PVC coated conduit, starting from minimum depth as specified and include the 90 degree Elbow up to 12" above finished grade.

2.7 All conduits installed under roads and driveway crossings shall be bored and sleeved with single schedule 80 PVC or 1/4"-wall steel sleeve. Roadways and driveways shall not be crossed by open cut unless approved by DPW in writing. Wherever boring is impractical, street crossings shall be limited to three (3) days maximum (including trenching, compaction, and replacement of existing pavements). Contractor shall provide steel matting sufficient to carry the traffic load of the excavated area.

2.8 Manholes shall be 8'x8'x7' (minimum inside dimension). Maximum spacing shall be 450 feet on centers. Cable Support Systems located in manholes shall be constructed of a nonconductive material. All cables in manholes shall be identified with a nonconductive tag & permanent marker, tags shall identify circuit at each point where the cable either enters or exits the manhole.

2.9 All underground electrical and communication installations (conduit, duct bank, etc.) shall be identified using marking tape. Tape shall be placed 12-inches below finished grade. Tape shall have the following characteristics:

- (a) 5-mil plastic
- (b) Brightly colored (Electric–red; Communication– orange)
- (c) Not be less than 6 inches in width
- (d) Suitably inscribed at not more than 10 feet on centers
- (e) Continuous metallic backing and a corrosion resistant 1-mil metallic foil core to permit easy location of duct line.

2.10 Pad Mounted equipment:

2.10.1 Transformer, Pad Mounted: Provide Loop feed type, dead front construction, copper windings and bussing, with current limiting and bayonet oil immersed expulsion fuses, arresters, High-voltage warning signs, Dial-type thermometer, liquid-level gauge, and drain valve with built-in sampling device, Refer to UFC \_3\_550\_01 Exterior Power Distribution guidance. Transformer pad shall be a minimum of 6 inches larger than the transformer enclosure to include the cooling system. Pre-manufactured pads for pad mounted equipment such as transformers; sectionalizers etc. shall be not used. Concrete Pads shall be poured-in-place. Spare capacity of 20% minimum.

2.10.2 Pad Mounted Switch Gear: As a minimum, provide dead front pad mounted gear, PME-9, S&C or equal. Other circuit configuration shall be coordinated with DPW for approval. All switch and fuse components shall be included to include a minimum of 2 spare fuses. Switches shall be provided with Arc-resistance feature meet the requirement of IEEE standard C37.20.7 2001, "IEEE Guide for Testing Medium – Voltage Metal Enclosed switchgear for Internal arcing Faults". Switches shall be provided with a manual, handle-type operator or a push-button mechanical spring tripping mechanism, utilizing a stored-energy (spring-driven) mechanism to simultaneously open or close all phases. Switch pad shall be a minimum of 6 inches larger than the switch. Pre-manufactured pads shall be not used. Concrete Pads shall be poured-in-place.

2.11 Metering

1. Watt-Hour Metering

- (a) Watt-hour meters shall be installed on all facilities requiring new services and shall be connected to the base [Energy Enterprise Data Reporting System, EEDRS](#) (Note: Unless otherwise indicated, watt-hour metering will not be required where digital meters as specified below are provided). [Watt-hour meters shall be integrated and Contractor Field Tests \(CFTs\) performed and passed within a given specification.](#)

- (b) Watt-hour meter shall be surface-mounted, electronic-programmable type, with LCD display.
- (c) Meter will display readings for usage (kWh), demand (kW), and peak demand (including date/time of peak demand).
- (d) Meter shall be provided with a self-contained backup system to maintain memory and display during power failures.
- (e) Meter shall be provided with a modular connector(s) to provide interfacing for:
  - (1) Automatic Meter Reading (AMR)
  - (2) Pulse modules
  - (3) Analog signal modules
  - (4) Energy control modules
  - (5) Instantaneous demand displays
- (f) Meter shall communicate information to a remote data collection system, [EEDRS](#).
- (g) Meter shall conform to Unified Facilities Guide Specification (UFGS) 26 27 13.1030.
- (h) Where practical and feasible, meters shall be installed in a self-contained unit. Center of the unit shall be mounted as close to eye level as possible, but in no instance more than 72" A.F.F.

## 2. Digital Metering

- (a) Digital metering shall be installed in each switchboard or switchboard section for double ended applications. Monitors may also be remote mounted. Center of the monitor shall be mounted as close to eye level as possible, but in no instance more than 80" A.F.F.
- (b) Metering shall conform to Unified Facilities Guide Specification (UFGS) 26 27 13.1030
- (c) All setup parameters required by the electronic monitor shall be stored in non-volatile memory and retained in the event of a control power interruption. Any battery or other device used to provide non-volatile memory shall be user serviceable from the front of the monitor and servicing shall not require removing the monitor from the gear in which it is mounted.
- (d) The monitor shall maintain in non-volatile memory maximum and minimum values for each of the instantaneous values reported as well as the time and date that the minimum or maximum was set.
- (e) The monitor shall have the ability to communicate information to a remote data collection system.
- (f) All necessary instrument transformers (CTs/PTs) shall be provided in the switchgear.
- (g) The monitor shall be listed according to UL 508.

- (h) The monitor shall provide true RMS metered values accurate for distorted, non-sinusoidal wave-shapes beyond the 30<sup>th</sup> harmonic (fundamental of 60 hertz).
- (i) The monitor shall be accurate to  $\pm 0.25\%$  of reading  $\pm 0.05\%$  of full scale for voltage and current metering, and  $\pm 1.0\%$  for all power and energy functions. The accuracy shall be maintained for both light and full loads. No annual re-calibration by users shall be required.
- (j) Voltage and current for all phases shall be sampled simultaneously to assure high accuracy in conditions of low power factor or large waveform distortions (harmonics).
- (k) The monitor shall be equipped with an integral, continuous duty, long-life display to provide local access to the following metered quantities as well as the minimum and maximum value since last reset of each quantity:
  - (1) Current (RMS), per phase and neutral
  - (2) Voltage, phase-to-phase and phase-to-neutral
  - (3) Real power, per phase and 3-phase total
  - (4) Reactive power, per phase and 3-phase total
  - (5) Apparent power, per phase and 3-phase total
  - (6) Power factor, 3-phase total and per phase
  - (7) Frequency
  - (8) Demand current, per phase and three phase average
  - (9) Demand real power, three phase
  - (10) Demand apparent power, three phase
  - (11) Accumulated Energy, (MWH and MVARH)
  - (12) THD, current and voltage, per phase
  - (13) K-factor, current, per phase
- (l) The following demand readings shall be reported by the monitor:
  - (1) Average demand current, per phase
  - (2) Peak demand current, per phase
  - (3) Average demand for real power, reactive power, and apparent power
  - (4) Predicted demand for real power, reactive power, and apparent power
  - (5) Peak demand for real power, reactive power, and apparent power
  - (6) The default demand calculations method shall be 15-minute interval.
- (m) Installation contractor shall be required to provide documentation verifying proper meter calibration and verifying proper operation/readings during commissioning of the equipment.

2.12 Padlock: Provide provision for padlock for major equipment. Coordinate with DPW

## 2.13 COORDINATED POWER SYSTEM PROTECTION:

2.13.1 The study shall be performed by a registered professional engineer with demonstrated experience in power system coordination in the last three years.

2.13.2 Scope Analysis: The fault current analysis, and protective device coordination study shall begin at the source bus and extend down to system bused where fault availability is 10,000 amperes (symmetrical) for building/facility 600 volt level distribution buses. Coordinate with DPW

2.13.3 Determination of facts: The time-current characteristics, features, and nameplate data for each existing protective device shall be determined and documented. The Contractor shall coordinate with the commercial power company for fault current availability at the site.

2.13.4 A single line diagram shall be prepared to show the electrical system buses, devices, transformation points, and all sources of fault current (including generator and motor contributions). A fault-impedance diagram or a computer analysis diagram may be provided. Each bus, device or transformation point shall have a unique identifier. If a fault-impedance diagram is provided, impedance data shall be shown. Locations of switches, breakers, and circuit interrupting devices shall be shown on the diagram together with available fault data, and the device interrupting rating.

2.13.5 Coordination Study: The study shall demonstrate that the maximum possible degree of selectivity has been obtained between devices specified, consistent with protection of equipment and conductors from damage from overloads and fault conditions. The study shall include a description of the coordination of the protective devices in this project. Provide a written narrative that describes: which devices may operate in the event of a fault at each bus; the logic used to arrive at device ratings and settings; situations where system coordination is not achievable due to device limitations (an analysis of any device curves which overlap); coordination between upstream and downstream devices; and any relay settings. Recommendations to improve or enhance system reliability, and detail where such changes would involve additions or modifications to the contract and cost changes (addition or reduction) shall be provided.

2.13.6 Study Report: The report shall include

- (a) narrative describing the analyses performed; the bases and methods used; and the desired method of coordinated protection of the power system.
- (b) Descriptive and technical data for the new protective devices proposed.
- (c) Document utility company data including system voltages, fault MVA, system X/R ratio, time-current characteristics curves, current transformer ratios, and relay device numbers and settings; and existing power system

data including time-current characteristic curves and protective device ratings and settings.

- (d) Fully coordinated composite time-current characteristic curves for each bus in the system, as required to ensure coordinated power system protection between protective devices or equipment. The report shall include recommended ratings and settings of all protective devices in tabulated form.
- (e) Provide the calculation performed for the analyses, including computer analysis programs utilized. A software package, of the same version used for the short circuit and coordination study shall be provided.

### **3. SECTION: MOTOR CONTROL CENTERS, SWITCHBOARDS/GEAR and PANELBOARDS**

3.1 Motor control centers, switchboards/gear and Panels Bus bars shall be copper. Size 200% Neutral for non-linear load. Switchgear bus bars shall be silver plated. Provide directories to show load served and source.

3.1.1 Ground bus: Provide full width at the bottom of the motor control center line-up. A full clamp-type solderless copper or copper alloy lug for No. 2/0 AWG stranded copper cable minimum shall be provided at each end of the bus for connection to the main grounding system.

3.1.2 Neutral Bus: A fully rated neutral bus shall be provided continuous through the control center. 200% rated neutral shall be provided for panels supplying electronics

3.2 Voltage Fault Protection: Provide protection against voltage faults, phase unbalance, phase loss, phase reversal, under-voltage and over-voltage

3.3 Distribution Transformers: Provide 200% neutral for dry type transformers supplying nonlinear loads. Use K-Factor rated, K4 for 50% and K13 for 100% connected nonlinear loads. Provide Copper windings type.

3.4 Switchboards: Provide dead-front construction. Mount switchgear on concrete slab.

3.5 Size panels to provide a minimum of 25% minimum future expansion.

### **4. SECTION: ELECTRICAL WORK, INTERIOR**

4.1 Use copper conductor only, Aluminum conductors shall not be used. Underground service entrance conductor shall be USE rated, with XLP or EPR insulation. Use THHN/THWN for interior wiring, minimum size for branch circuit conductor shall be No.12 minimum, no.8 AWG and larger shall be stranded, no.10 AWG and smaller shall be solid.

4.2 Equipment ground conductor: Provide insulated green conductor in all conduits.

4.3 Provide Transient voltage surge suppressors (TVSS) at service entrance panels, and panels supporting electronic equipment, shown on drawings schedules and/or line diagram.

4.4 CIRCUIT BREAKERS: Provide bolted type breakers, All ratings shall be clearly visible. Breakers used for switching shall be rated "SWD". Use of "Subfeed Breaker" is not acceptable unless specifically indicated otherwise. Main breaker shall be "separately" mounted on center, above or below branch breakers. Where "space only" is indicated, make provisions for future installation of breakers.

4.5 Electrical, Zinc-Coated Steel Metallic Tubing (EMT), (IMC): Use EMT in the interior and dry location areas. Unless otherwise noted, all conduits shall be concealed. Use EMT in mechanical and electrical rooms where conduits are physically protected, otherwise provide Galvanized Rigid steel conduit shall be used. The use of MC and Romex cables are not be acceptable, except MC cable may be used as whips to lighting fixtures.

4.6 Control wiring related to mechanical equipment such as HVAC, installed in the mechanical room, un-accessible areas and areas subject to traffic shall be installed in conduit. Cable shall be rated for the applications. All control related to electrical equipment, such as motors, lighting control, etc. shall be installed in conduit.

4.7 Each motor of 1/8 hp or larger shall be provided with thermal-overload protection and heavy duty disconnecting mean. Provide spare parts fuses.

4.8 Pull wires: Provide a pull wire in all empty raceway

4.9 Stub-Up & through slabs-on-grade conduits: Where conduits are to be stubbed up through concrete floors, a short elbow shall be installed below grade to transition from the horizontal run of conduit to a vertical run. A conduit coupling fitting, threaded on the inside shall be installed, to allow terminating the conduit flush with the finished floor. Conduit shall be Galvanized rigid steel.

4.10 Communications: Use Army Technical Guide for Installation Information infra structure architecture (I3A). Coordinate with NEC.

4.11 Receptacles: Provide one receptacle per wall minimum, and every 12' maximum, install no more than 6 receptacles per branch circuit and as required per load. Use 20A heavy duty, grounding type receptacles, side wired. Receptacles with ground fault circuit interrupters shall be UL Class A type, with Set-reset buttons of contrast color.



4.11.1 Wet location Receptacles: Receptacles in wet locations shall be installed in an assembly rated for such use whether the plug is inserted or withdrawn.

4.12 Switches: Switches shall be rated for quite type AC only, 120/277volts with 20A current rating. Use lighting control as required by UFC 3-350-01.

4.12.1 A neutral conductor shall be installed in all switch boxes.

4.13 Splices: Use wire nut connectors for no.10 AWG and smaller. Do not use Quick Connect type wire connectors. Use solderless connectors for No.8 and larger and cover with insulation material same rating as conductor insulation.

4.14 Provide calculations for Panel Loads, Lighting, Feeders, Voltage drop, short circuit, load analysis, Coordination study, etc. See other sections.

4.15 Use fluorescent lighting fixtures with 100% electronic high frequency type, instant start ballasts, 95% minimum HPF, with no magnetic core and coil. Ballast shall be connected in parallel, where if one or more lamps fails or are removed shall permit the operation of other lamps. Use 32W, T8 lamps, 10% THD maximum. Do not use ballast to serve multi fixtures. For emergency fixture, provide a backup power, red light indicator (LED) and test switch. Use other energy efficient lighting as coordinated and approved for the applications.

4.16 Use LED type exit light with backup power, red light indicator (LED) and test switch.

4.17 Contractor shall provide temporary power as required to keep the facility in operation during the construction period. Coordinate with DPW and the user.

4.18 For Facilities with COM and TV, provide copper bus bar suitable for indoor application to conform to TIA J-STD-607-A grounding requirements, size ¼" X 4" X (length as required)

## **5. ELECTRICAL WORK, EXTERIOR**

### **General:**

- (a) Pad mounted equipment shall have permanently affixed identification labels. Labels shall be weather resistant, engraved, metal or phenolic plastic. Labels shall indicate equipment identification, rating, and circuit designation. Information for equipment identification and circuit designation (line side, load side) will be Coordinated with DPW. Place label on the front door of the pad mounted transformer, this is in addition to the label located inside the transformer, see attachment#1.

- (b) Cables shall have permanent identification tag installed at each manhole, hand hole, pull box, or termination. Labels shall be weather resistant, engraved, metal or phenolic plastic. Labels shall indicate at a minimum the circuit designation and To/From information. Information for circuit designation shall be Coordinated with DPW.
- (c) All bussing in electrical equipment shall be copper.
- (d) Bore under roads, provide Galvanized Rigid Steel conduit, PVC coated or provide PVC conduit-in-casing, with spacers. Provide spare conduit of equal size. Use Underground Devices Incorporated product or equal.

6. FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE  
(Coordinate with the Fire Department, (580) 442-5911)

- 6.1 Use factory painted RED color EMT conduit inside the building
- 6.2 Use MONACO transceiver; transmit at a frequency of 141.3625 MHZ, Coordinate with Monaco Enterprise and the fire department.
- 6.3 Provide 72 hours battery backup power, 15 minutes Alarm test.
- 6.4 Fire Alarm system devices (initiating and notification) shall be addressable type, Class A, NAC devices style Z, IDC devices style D, SLC devices style 6, Size each SLC and NAC to provide a minimum of 40 percent expansion without hardware modifications to the panel. System shall be capable to communicate with the existing D-21 fire protection management system located at Fort Sill fire station and 911 center in Lawton.
- 6.5 Provide visual notification signals in areas where hearing protection is worn due to high ambient noise levels. Also, visual notification signals must be provided in all areas of the building, even if some areas in the building are only accessed occasionally by personnel who are hearing impaired and granted unaccompanied access, such as maintenance or cleaning personnel.
- 6.6 Provide OVERVOLTAGE AND SURGE PROTECTION at the input power of panels, circuits that exit or enter a building.
- 6.7 provide a graphic Annunciator panel or remote control (LCD) panel as required by the fire department.
- 6.8 Use single action key operated pull station. Break glass, wrench operated pull station are not acceptable.

7. Mass Notification System (MNS):

Coordinate with the fire department, (580)442-5911 & Force Protection, (580) 442-5973

## 8. LIGHTNING PROTECTION SYSTEM

8.1 Provide lightning protection as required. System shall be UL certified.

- (a) Provide Safety Tip air terminals
- (b) Where Ground grid/counterpoise is used, install 30 inches below grade minimum, at a distance not less than 3 feet nor more than 8 feet from the structure.
- (c) All Connections between the building steel columns and ground (counterpoise, Rods) shall be at the bottom of the columns. Use Cad-weld connections.
- (d) Where poles are used for overhead system and ground rods are required, install the first ground rod a minimum of 6 feet from the pole base.

## 9. CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)

9.1 Provide Cathodic Protection System, sacrificial Anodes to the sprinkler system riser entering the building from below grade. Coordinate with AWE for water piping and ONG for gas in other areas.

# Attachment #1

## **Ft. Sill DPW**

### **New Padmounted Transformer Labeling Information**

(Place label on the front door of the padmounted transformer. This is in addition to the label located inside the transformer.)

#### **Label Example:**

**500 kVA  
13.2kV-208/120V  
TP 2 1602**

#### **Label Explanation:**

**Number of XFMRs and Size: 3-25kVA, or 1-50, 2-37.5kVA, or 500kVA**

**Voltage: 13.2kV-480/277V or 208/120V**

**Code: TP 2 1602**

**TP indicates – Transformer, Padmounted**

**2 indicates – Feeder Number**

**1602 indicated – Bldg Number**

**Signature: \_\_\_\_\_**

**Date: \_\_\_\_\_**