SECTION 26 05 43 – UNDERGROUND DUCTS AND RACEWAYS FOR MEDIUM VOLTAGE ELECTRICAL SYSTEMS

PART 1: GENERAL

1.01 Scope of Standard

A. This standard provides general guidance concerning the specific preferences of Texas State University for Underground Ducts and Raceways for Electrical System.

B. Texas State University recognizes that project conditions and requirements vary, thus precluding the absolute adherence to the items identified herein in all cases. However, unless there is adequate written justification, it is expected that these guidelines will govern the design and specifications for Texas State University projects.

1.02 Scope of Work

A. The work included in this section of the construction standards consists of the design requirements for the complete layout and installation of a concrete encased duct system. This is a design standard and is not intended to be used as a construction specification. The duct bank system shall be used for the distribution of electrical services. In addition to the requirements defined elsewhere, the contractor shall adhere to the following minimum requirements:

B. All excavation shall meet the current requirements of O.S.H.A. and any other governing federal, state or local authority with regards to trench safety. The project engineer shall require a Trench Safety Plan signed and sealed by a registered Engineer of the State of Texas.

C. The project engineer shall require provisions for a suitable means of containment and abatement of water run-off contaminated construction materials. These procedures shall meet all local, state, and federal regulations and requirements.

PART 2: PRODUCTS

A. Ducts:

1. Approved Manufacturers: Carlon Electrical Products, Cantex, or approved equal.

2. All ducts shall be Schedule 40 Rigid Nonmetallic Conduit or Schedule 40 Rigid Nonmetallic utility conduit with integral bell ends.

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3. Sleeves installed for electrical access routes under pavement shall not be used for any other utility.

B. Concrete:

1. Concrete envelope requirements shall be defined in Division 3 of the design standard. Electrical designer shall be responsible for coordinating minimum concrete standards with the project civil engineer. The minimum requirements are:

a. 3/8" minimum aggregate

b. Slump: 4-1/2" – 5"

c. Strength: 3000 psi, in accordance to ASTM 039-44

d. Electrical concrete envelope shall contain red dye at 8 lbs. per cubic yard of concrete.

C. Vaults

1. The vaults shall be precast concrete. The vault shall have grade 60 reinforcement of H20 loading and 4500 psi concrete. Precast terminators shall be provided at each penetration shown on the drawings.

2. All vaults shall have 36" dia. round entrance covers, sump pits, and 120 VAC receptacle located in the entry to the vault. Vault access or cover shall be level with finished grade. All vaults, where splices and/or terminations are made, shall be no smaller than 10' x 10' x 8'.

3. Entire exterior shall be waterproofed with coating such as bituminous waterproofing mastic.

4. Vaults shall not be installed where water will cover the access, such as in 'run-off' areas or where water tends to 'pond'.

5. Locate pulling eyes opposite raceways.

6. Vaults shall be equipped with a traffic weight vault ring and cover with the word "ELECTRIC" stamped clearly thereon.

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7. All vaults shall have a driven ground rod, driven horizontal, approx 4’ below finished grade, with a maximum resistance reading of 25 Ohms. Ground rod shall be Cad-welded to grounding conductor. Ground rod shall be connected to a fully closed loop of grounding conductor that is used to bond all splices and non-current carrying electrical equipment in vault. Connections shall be made to racks with listed connectors suitable for the purpose. Loop of conductors shall be between 12” and 24” above floor and shall be securely attached to wall of vault.

8. Cable support racks shall be nonmetallic.

9. Cable shall be secured by cable ties that are fungus resistant, ultra-violet and heat stabilized and are made of self-extinguishing nylon material.

10. All penetrations in vaults shall be watertight.

D. Pumps

1. Install a pump and the circuit for it in all vaults. Pump manufacturer and model is Wayne CDT 508 or equal. Circuit should come from a local source such as a building equipment room panel. Circuit identification shall be clearly marked in the neck or throat of the vault by means of a plastic plate or tag and securely fastened into place.

PART 3: EXECUTION

3.01 Design/Drawing Requirements

A. The bank of ducts shall be installed by the built-up method. Engineer shall require 3” base and intermediate Snap-Loc spacers installed 3” above the bottom of the trench and spaced throughout the duct bank at 6’ on center. The concrete envelope shall be reinforced with #4 rebar along the continuous length of the ducts and #4 stirrups located at 4’ intervals.

B. Grounding: Duct banks containing power conductors shall have one #4/0 bare copper ground located in the lower portion of the duct bank. The ground conductor shall extend 4 feet into buildings and vaults. Also, a #2/0 conductor for use with grounding shall accompany all circuits in raceways.

C. Designer shall require factory bends and sweeps of 36” minimum radius.

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D. All ground and asphalt repair shall be covered in the Civil related sections of the construction standard.

E. Vault Grounding and Design

1. Grounding System:

a. Duct bank grounding conductor shall penetrate wall of vault on all applicable sides and extend 4’ inside the vault.

b. A looping grounding system consisting of #4/0 bare copper wire shall completely encircle each vault and shall be thermowelded at all connections including the duct bank grounding conductor penetrating the vault.

F. Drawing Requirements:

1. Duct bank detail design shall, as a standard, be coordinated through the civil engineer and civil drawings. As a minimum, the electrical engineer shall provide a site plan depicting the quantity of ducts and the general routing of the ducts through the campus infrastructure and plan profiles indicating the quantity and intended conduit layout in the duct bank. The electrical engineer shall locate new vaults, and existing vaults and ducts where applicable to coordination. New vaults shall be clearly indicated and labeled according to the campus labeling standard. The site plan shall also indicate existing utilities (other than electrical) and locations and coordinate conflicts.

2. The electrical engineer shall provide sufficient duct bank details to depict electrical requirements including grounding and minimum cover. All site repair shall be done in accordance with campus accepted civil practices and campus standard details.

3. The electrical engineer shall provide duct bank profile drawings indicating conduit layout in the duct bank. A profile drawing shall be required for each layout of ducts.

4. The electrical engineer shall provide sufficient vault details to depict proper grounding practices, and typical ring and cover placement.

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5. The electrical engineer shall provide sufficient details for building penetrations and terminations for each building affected by the design.

G. For reliability, full redundancy is required for the primary distribution system.

H. The system shall be designed to ensure that alternate feeder usage and switching due to the failure of any single component of the primary system will not prevent the alternate system from carrying the full capacity of the additional load.

I. Each building shall have its own building service transformer.

J. Ducts:

1. Approved Manufacturers: Carlon Electrical Products or Cantex.

2. All ducts shall be Schedule 40 Rigid Nonmetallic Conduit or Schedule 40 Rigid Nonmetallic utility conduit with integral bell ends.

3. Electrical ducts shall be 5” minimum, standard.

4. Designer shall require 3” base and intermediate Snap-Loc spacers installed 3” above the bottom of the trench and spaced throughout the duct bank at 6’ on center. The concrete envelope shall be reinforced with #4 rebar along the continuous length of the ducts and #4 stirrups located at 4’ intervals.

5. Designer shall require factory bends and sweeps of 36” minimum radius.

6. All ground and asphalt repair shall be covered in the Civil divisions of the standard.

K. Concrete:

1. Concrete envelope requirements shall be defined in Division 3 of the design standard. Electrical designer shall be responsible for coordinating minimum concrete standards with the project civil engineer. The minimum requirements are:

a. 3/8” minimum aggregate

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b. Slump: 4-1/2" – 5"

c. Duct bank shall be totally encased in 3000 psi. concrete with Red dye at 8 lbs. per cubic yard of concrete, stirred within the mix. (Not sprinkled on top).

L. Drawing Requirements:

1. Duct bank detail design shall, as a standard, be coordinated through the civil engineer and civil drawings. As a minimum, the electrical engineer shall provide a site plan depicting the quantity of ducts and the general routing of the ducts through the campus infrastructure and plan profiles indicating the quantity and intended conduit layout in the duct bank. The electrical engineer shall locate new vaults, and existing vaults and ducts where applicable to coordination. New vaults shall be clearly indicated and labeled according to the campus labeling standard. The site plan shall also indicate existing utilities (other than electrical) and locations and coordinate conflicts.

2. The electrical engineer shall provide sufficient duct bank detail to depict electrical requirements including grounding and minimum cover. All site repair shall be done in accordance with campus accepted civil practices and campus standard details.

3. The electrical engineer shall provide duct bank profile drawings indicating conduit layout in the duct bank. A profile drawing shall be required for each layout of ducts.

4. The electrical engineer shall provide sufficient vault details to depict proper grounding practices, and typical ring and cover placement.

5. The electrical engineer shall provide sufficient details for building penetrations and terminations for each building affected by the design.

END OF SECTION 26 05 43