PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Publications and Standards
B. Work Sequencing and Coordination
C. Telecommunications Submittals
D. Quality Assurance

1.2 PUBLICATIONS AND STANDARDS

A. California Electrical Code (CEC) (ANSI/NFPA 70):
   (1) Chapter 8: “Communications Systems”
   (2) Article 250: “Grounding”

B. Electronics Industry Association/Telecommunications Industry Association (EIA/TIA):
   EIA/TIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications

C. Federal Communications Commission (FCC) Part 15 and Part 68

D. Rural Utilities Services (RUS), formally REA

E. Lightning Protection Code - ANSI/NFPA 780

F. American Society for Testing Materials (ASTM) Publications

G. National Electrical Manufacturer’s Association (NEMA) Publications


J. Underwriter’s Laboratories Inc. (U.L.) Publications
   (1) 6-1981 (R86) Rigid Metallic Conduit
   (2) 514B-1982 Fittings for Conduit and outlet Boxes
   (3) 651-1981 Schedule 40 and 80 Rigid PVC Conduit
   (4) UL 467 “Grounding and Bonding Equipment”
   (5) UL 497, 497A, and 497B “Communications Circuit Protectors”
1.3 RELATED SECTIONS
   A. Contract General Conditions, Supplemental General Conditions, Special Conditions and Contract Terms
   B. Section 16710 - Telecommunications General Requirements
   C. Section 16715 - Telecommunications Acceptance Testing
   D. Section 16720 - Telecommunications Basic Materials and Methods
   E. Section 16725 - Telecommunications Cable
   F. Section 16740 - Building (RF) CATV System
   G. Section 16760 - Telecommunications Bonding and Grounding

1.4 SUBMITTALS
   A. Submittals for new utility vaults (and hardware), pull boxes, conduit, detectable warning tape and raceway tags shall be made as defined in Section 16710.

1.5 QUALITY ASSURANCE
   A. For products or workmanship specified by association, trade, Federal, or State Standards, the Contractor shall comply with the requirements of the standard. When more rigid requirements are specified or required by applicable (City) codes, the Contractor shall comply with City codes.
   B. The Contractor shall conform to reference standard by date of issue current on final design documents.

PART 2 - PRODUCTS

2.1 COMMUNICATIONS PULL BOXES
   ALL UTILITY VAULTS TO BE PLACED SHALL BE SPECIFICALLY DESIGNED FOR TELECOMMUNICATIONS APPLICATIONS, WITH NO EXCEPTIONS.
   A. Materials
      (1) The Contractor shall provide pre-cast utility vaults meeting ASTM C 478 with 28 day 5500 psi minimum compressive strength concrete and designed for AASHTO H-20 loading per AASHTO HB 14.
      (2) Utility vaults shall have tongue-and-groove double sealed joints on mating edges of pre-cast components. The joints shall firmly interlock adjoining components and provide waterproof junctions and adequate shear transfer. Joints shall be sealed with approved watertight joint sealant as prescribed in the manufacturer’s installation specifications and conforming to AASHTO M198, Type B. Sealing material shall be installed in strict accordance with manufacturer’s printed instructions.
(3) Conduit Entrances
   (a) Knockout panels or pre-cast individual conduit openings may be used.
   (b) On sides where no conduit is installed, 12-inch high by 12-inch wide (minimum) knockout panels for future raceway installation shall be provided.
   (c) For existing utility vaults, new ducts shall enter the utility vault with factory-formed bell end of the conduit, and a seal around the conduit shall be applied after installation. Existing utility vaults shall be retrofitted with the required racking and grounding and bonding per the TIA/EIA Bonding and Grounding Standards.

(4) Covers
   (a) The Contractor shall provide solid covers (traffic rated), with a 76.2 cm (30 in.) diameter clear opening.
   (b) Heavy-duty type frames and covers made of cast iron, suitable for H-20 loading, and having machined bearing surfaces shall be used.
   (c) The covers shall be of indented type with solid top design.
   (d) The upper side of each cover shall have the letters “Communications” cast or burned by welder, in integral letters no less than 2 inches high. Either the covers or the ring of the casting shall be field stamped with utility vault or pull box numbers provided by the campus.

B. Manufacturers: Associated Concrete Products, Brooks Products, & Utility Vault Company or approved equivalent product.

C. Pull boxes shall be equipped with a minimum of approved cable racking on one long wall suitable to support large copper cables as called for on the design documents.

D. All pull boxes shall be equipped with traffic-rated lids with a locking mechanism. All lids shall have the identification marking of “Communications” permanently affixed to the cover. The pull box number identification shall be stamped or welded on the cover per the University’s specified numbering plan.

B. Manufacturers
   (1) Utility Pull Boxes: Brooks, Utility Vault, or Associated Concrete Products, or an approved equivalent product.

2.2 COMMUNICATIONS DUCT-BANKS

A. Materials
   (1) Conduit
      (a) Schedule 40 PVC - 4 inch inside diameter.
      (b) Type C telephone conduit - 4 inch inside diameter
      (c) Multi-cell conduit system - 4 pre-lubricated innerducts, with 1.194 inch diameter and .063 inch minimum wall thickness, in a Type C 4-inch diameter conduit with an extended 6-inch integral bell end.
(d) Corrugated flexible orange innerduct, 1 inch in diameter, will be placed for fiber optic cable protection. A minimum of 4 innerducts shall be placed in a 4-inch conduit.

(2) Conduit shall have a factory formed bell on one end for interconnecting segments.

(3) Conduit located under heavy use highways or railroad rights-of-ways shall be encased in steel consistent with the AASHTO or REA specifications. The thickness of the steel casing shall be engineered for each specific application. This may vary based on campus codes.

(4) Spacers: High impact spacers shall be used in all multi-duct systems, for both solely-owned or joint telecommunications/power construction. They shall conform with NEMA TC-2, TC-6, TC-8, and ASTM F 512 dimensions.

(5) All fittings shall be designed specifically for use with the type of conduit placed.

(6) All conduits shall be equipped with seal plugs in all utility vaults/pull boxes and expansion rubber seal plugs within all buildings.

G. Manufacturer: CARLON or approved equivalent.

2.3 COMMUNICATIONS ENTRANCE CONDUIT

A. To prevent shear, all conduit entering a building shall transition from PVC to metal or shall be contained in a metal sleeve from a distance of 24 inches beyond the exterior of the foundation to six inches within the building. These conduits shall slope downward away from the building to reduce the potential of water entering the building.

2.4 DUCT-BANK LOCATING CABLE (DETECTABLE WARNING TAPE)

A. Warning tape shall be a minimum of 3” wide, orange in color, and shall have a nondegradable imprint as follows:

(1) “Caution Telephone Cable Buried Below”

(2) “Caution Fiber Optic Cable Buried Below”

B. The tape shall be detectable.

C. Manufacturer:

(1) Carlon

(a) MAT3T61 “Caution Telephone Cable Buried below”

(b) MAT3061 “Caution Fiber Optic Cable Buried Below”.

(2) Equivalent manufacturer's type and style is acceptable.
2.5 PULL ROPE

A. Pull rope shall be new ¼" polypropylene over polyester rope with a minimum 1700 lb. tensile strength.

B. Manufacturers: CARLON: Part No. SB14105, or approved equivalent.

2.6 RACEWAY TAGS

A. Permanent markers with raceway designations engraved onto the tag shall be provided. Tags relying on adhesives or taped-on markers shall not be used. The tags shall attach to raceways with nylon ties.

PART 3 - EXECUTION

3.1 COMMUNICATIONS UTILITY VAULTS AND PULL BOXES

A. General

(1) The Contractor shall obtain all required permits and notifications before commencing any work operations.

(2) All state and local ordinances shall be complied with at all times.

(4) All federal, state, and local safety rules, including OSHA, will be enforced at all times during the duration of the project. It is the responsibility of the Contractor to inspect the job site to ensure compliance.

B. Final location of all communications utility vaults and pull boxes shall be determined by the Contractor and campus project staff.

C. All conduits entering a utility vault or pull box shall be placed at right angles to the short walls and shall be sealed to prevent seepage unless otherwise specified on the construction documents.

D. Shoring shall be in accordance to prevailing underground construction codes, i.e., OSHA, G. O. 128, NESC, and all applicable local, state, and federal statutes.

G. Finish grade shall be established prior to placing structures.

H. The Contractor and the University shall inspect all pull boxes and utility vaults prior to backfilling.

I. Backfill materials shall have been sifted to provide a sand equivalent of not less than 20, and a sieve size of No. 4. Backfill material shall be mechanically compacted to a minimum relative compaction of 90 percent to a level six (6) inches above final grade. The excess material shall be excavated to the final grade upon acceptance of compaction.

J. Existing and/or new communications utility vaults/pull boxes may be placed near the existing power and signal vault system. The Contractor shall either place new or enlarge existing utility vaults/pull boxes and conduits in such a manner as to not disturb existing utilities while maintaining specified clearances from all obstructions. This may require
clearing much of the area around the vaults by hand. The final placement and depth shall be determined by the Contractor and campus project staff.

K. The Contractor shall locate all existing utilities within 20 feet of the new and/or enlarged utility vault/pull box system. The Contractor and campus project staff shall review and approve any revised coordination schematics. Caution shall be used when working in this area. The University's existing high power electrical conductors may be transported in the primary electrical duct structure directly adjacent to the secondary electrical and signal ducts.

L. The Contractor shall excavate around existing vaults using caution to identify and preserve all utilities in the area.

3.2 DUCT BANKS AND CONDUITS

A. All communications conduit banks shall be encased in concrete with at least 3 inches of concrete at the top and bottom and 2 inches on each side. A horizontal and vertical separation of 1 inch between the ducts shall be maintained by installing high impact spacers with horizontal and vertical locking intervals of ten feet.

B. All communications conduit shall be placed in a uniform manner between vaults. Conduit in position #1 at one utility vault shall maintain its position within the duct run and terminate in the #1 position at the next utility vault. The position of all conduits between utility vaults shall be maintained.

C. Long radius bends (over 30 feet) shall be used whenever possible to make changes in direction. If it is found to be necessary to place a 90 degree bend in the conduit run, a factory-made sweep of no less than 48 inch radius shall be used. No conduit run shall exceed a total of 180 degrees of bend between any two points (such as utility vaults or buildings) considering both vertical and horizontal sweeps. Cold formed trench bends shall have a radius of not less than 40 inches and shall pass mandrel integrity. Bend radius criteria are 2” or less, is 6 times the diameter of the conduit and, for any conduit larger than 2”, 10 times the diameter of the conduit.

D. The length and destination of all conduits shall be identified in each utility vault, pull box, and building. Embossed metal or heavy plastic tags strapped to each conduit shall be used.

E. After installation of communications conduit and after the concrete encasement has cured, the Contractor shall prove all conduits by pulling a mandrel with a diameter ¼ inch smaller than the conduit and 6 inches long through each conduit end-to-end. An inspector designated by the Contractor and the University shall be notified 24 hours before this procedure. Each conduit shall be cleaned with a bristle brush to remove any debris.

F. All utility vault and pull box entrances shall be shear-blocked with standard concrete extending no less than 15 inches from the entry wall. All entering ducts shall be completely encased.

G. Utility marking tape (see 3.5.A) shall be buried 12 inches below the surface directly above the conduit.
H. All conduit structures shall be built with the telecommunications conduits placed above the power conduits unless otherwise called out on the construction drawings and approved by the campus. If this type of construction is required, it shall receive the prior approval of the Contractor, the University, and the Local Exchange Carrier.

I. All entrance conduits shall be securely fastened to the building. The end of the conduit located inside the building shall be sealed to prevent rodents, water, or gases from entering the building.

3.2 ENTRANCE CONDUIT

A. The Contractor and the University shall determine the placement of all entrance conduit. All Applicable standards shall be adhered to, i.e., NEC, BICSI, AT&T, and GTE, or G.O. 128.

3.5 LOCATING DUCT BANK CABLE

A. Underground detectable warning tape shall be placed in all trenches at one foot below the final grade after the conduit and encasement is complete. The tape shall indicate the type of cable that will utilize the substructure system, e.g., fiber optic or copper cables. The detectable warning tape shall be installed according to manufacturer’s specifications to ensure access to the tape for locating purposes.

3.6 PULL ROPE

A. Pull rope shall be new material that is free of knots, kinks, and abrasions.

B. Pull rope shall be placed as a single continuous length in every new duct and inner duct section.

C. Pull rope shall be secured at each end.

3.7 RACEWAY TAGS

A. Metallic tags shall be affixed to the pull box wall indicating the destination utility or pull box. If number is not evident, acquire this information from the Contract Administrator.

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