SECTION 16375 –ELECTRICAL –UNDERGROUND WORK

PART 1 GENERAL

1.1 REQUIREMENTS

This Specification shall be used as a guideline for underground electrical construction and selection of materials. For selection of materials, these guidelines should only be used for items that are **not** specifically called out in the construction drawings.

1.2 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 the basic designation only. The latest edition of each of these publications should be used unless stated otherwise.

1) American Concrete Institute (ACI)

ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318	Building Code Requirements for Reinforced Concrete

2) American National Standards Institute (ANSI)

ANSI C2	National Electrical Safety Code

3) American Society for Testing and Materials (ASTM)

ASTM B3	Soft or Annealed Copper Wire
ASTM B8	Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

4) National Electrical Manufacturers Association (NEMA

5) National Fire Protection Association (NFPA)

NFPA 70	National Electric Code

6) Underwriters Laboratories, Inc. (UL)

UL 6	Rigid Metal Conduit
UL 44	Rubber-Insulated Wires and Cables
UL 83	Thermoplastic-Insulated Wires and Cables
UL 467	Grounding and Bonding Equipment
UL 486A	Wiring connections and soldering lugs for use with copper conductors
UL 510	Insulating Tape
UL 514A	Metallic Outlet Boxes

UL 514B	Fittings for Conduit and Outlet Boxes
UL 854	Service-Entrance Cables
UL 1242	Intermediate Metal Conduit

1.3 DEFINITIONS

In the text of this section, the words conduit and duct are used interchangeably and have the same meaning.

1.4 SUBMITTALS

CONTRACTOR shall Submit the following for ENGINEER approval:

A. Manufacturer's Catalog Data:
1) Conduit
2) Fittings
3) Cable lubricants
4) Ground clamps
5) Cable tags
6) Cables
7) Cable tray hangers/fasteners
8) Any other specific materials required for this work

B. Test Instrument and Procedure:
1) Submit for use of ground megger with proposed method indicated.

C. Field Test Reports:
1) Insulation resistance test
2) Continuity test
3) Ground resistance tests

When testing grounding electrodes and systems, identify each electrode and system for each test, as well as the resistance and soil conditions at the time the measurements are taken.

PART 2 PRODUCTS

2.1 CONDUIT

Conduit and conduit sleeves shall comply with the following standards:

A. Rigid Metal Conduit UL 6, galvanized steel, threaded type.

2.2 FITTINGS

A. Metal Fittings, UL 514B, threaded type.

B. Outlet Boxes for Steel Conduit: Outlet boxes for use with rigid or flexible steel conduit shall be cast-metal cadmium or zinc-coated if of ferrous metal with gasketed closures and shall conform to UL 514A.

2.3 TAPE

A. Insulating Tape, UL 510, plastic insulating tape, capable of performing in a continuous temperature environment of 80 degrees C.

2.4 PULL WIRE

Reference Specification 16100, 2.9(F) for pull wire requirements.

2.5 CONDUCTORS

Reference Specification 16100, 2.8 "CONDUCTORS" for conductor requirements.

A. Wire and Cable manufactured more than 12 months prior to the date of delivery to the site shall not be used.

B. Wire and Cable Connector and Terminations:
Shall provide a uniform compression over the entire contact surface. Solderless terminal lugs shall be used on stranded conductors. Wiring connections and soldering lugs for use with copper conductors shall conform to UL 486A.

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2.6 Grounding and Bonding Equipment (UL 467)

Reference Specification 16060 "GENERAL GROUNDING"

PART 3 EXECUTION

The CONTRACTOR shall be responsible for all of the following EXECUTION items:

3.1 INSTALLATION

Installations shall comply with NEC (NFPA 70) and ANSI C2 requirements.

3.2 DUCT AND CONDUIT INSTALLATION

A. Run conduit in straight lines except where a change of direction is necessary.

B. Except at conduit risers, accomplish changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, by long sweep bends having a minimum radius of curvature of 25 feet. Sweep bends may be made up of one or more curved or straight sections or combinations thereof.

C. As each conduit run is completed for conduit sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install pull wire/rope and conduit plugs.

D. For conduit sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install pull wire/rope and conduit plugs.

E. Conduit Protection at Concrete Penetrations

Galvanized conduits which penetrate concrete (slabs, pavement, and walls) in wet locations shall be protected by a PVC sheath at the penetration; PVC sheath be 40-mils thick conforming to NEMA RN 1, and shall extend from at least 2 inches within the concrete to the first coupling or fitting outside the concrete (minimum of 6 inches from penetration).

F. Power Wire and Cables

1) Cables shall not be spliced unless indicated on drawings. If the CONTRACTOR feels the need to splice cables he shall submit a written request for each splice to the OWNER and ENGINEER for approval.

G. Cable Pulling:

1) Test existing duct lines with a mandrel and thoroughly swab out to remove foreign material before pulling cables.
2) Accumulate cable slack at each junction box where space permits by training cable around the interior to form one complete loop.
3) Maintain minimum allowable bending radii in forming such loops. Do not exceed the specified cable bending radii when installing cable under any conditions, including turnups into equipment.

4) Cable with tape or wire shield shall have a bending radius not less than 12 times the overall diameter of the completed cable. If basket-grip type cable-pulling devices are used to pull cable in place, cut off the section of cable under the grip before terminating.

H. Cable Lubricants

Reference Specification 16100, 2.8(F) for Cable Lubricant requirements.

I. Cable Pulling Tensions:

1) Tensions shall not exceed the maximum pulling tension recommended by the cable manufacturer. Monitor pulling tension during cable installation with equipment specifically designed to ensure maximum pulling tension is not exceeded.

J. Grounding Systems

Install as indicated on construction drawings. Reference Specification 16060 “GENERAL GROUNDING” For requirements.

K. FIELD TESTING

In addition to requirements that may be stated elsewhere in the contract, notify the ENGINEER 5 working days prior to each test. Furnish labor, equipment and incidentals required for testing, except that the CONTRACTOR will provide electric power required for the tests. Correct defects in the work provided by the CONTRACTOR and repeat tests until the work is in compliance with contract requirements. Show by demonstration in service that circuits and devices are in good operating condition.

L. FIELD QUALITY CONTROL

In addition to requirements that may be stated elsewhere in the contract, provide written notification to the ENGINEER and OWNER 10 working days prior to concealing installed work. Furnish labor, equipment and incidentals required for inspection. Correct defects in the work provided by the CONTRACTOR and repeat inspection after the work is in compliance with the contract requirements. Show by demonstration that installation is in good operating condition.

END OF SECTION