SECTION 16402

UNDERGROUND ELECTRIC SERVICE

PART 1 GENERAL

1.1 SUMMARY

A. Description of System
   1. Furnish all labor, materials, and equipment for below grade work external to buildings as required, and furnish and install all equipment and material, including underground duct banks, direct burial conduit, manholes, lighting standard foundations, and concrete work for electrical work, as indicated or specified.

B. Related Work Specified Under Other Sections
   1. Excavating, trenching, backfilling, and grading for Electrical Work - SECTION 02300.

1.2 SUBMITTALS

A. Furnish submittals for items that are identified in this SECTION by a different typeface and a bracketed code (e.g., *Item [L]*). Refer to SECTION 01340 for definition of codes for types of submittals and the administrative requirements governing submittal procedure. Additional submittal requirements pertaining to this SECTION are specified herein under this Article.

B. Include complete data on each item. Coordinate the items, as they relate to the work, prior to submittal.

PART 2 PRODUCTS

2.1 MATERIALS

A. Underground Duct - Concrete Encased
   1. Plastic Conduit: Rigid PVC conduit per NEMA Standard TC-2 Designation EPC-40-PVC standard lengths with tapered ends and matching solvent-weld type couplings.
      a. Carlon
      b. Certain Teed Corp.
      c. Condux International, Inc.
      d. The George-Ingraham Corp.
      e. Scepter Corp.
   2. Rigid Steel Conduit: SECTION 16050.

B. Direct Burial Conduit
   1. Plastic Conduit: Rigid PVC conduit per NEMA Standard TC-2, Designation EPC-40-PVC, standard lengths with tapered ends and matching solvent-weld type couplings.
      a. Carlon
      b. Condux International, Inc.
      c. The George-Ingraham Corp.
      d. Olin
      e. Triangle
   2. Rigid Steel Conduit: SECTION 16050.

C. Conduit And Fittings For Pole Risers
   1. Conduit: Rigid steel, SECTION 16050.
   2. Cable Support Fittings: Ventilating sealing bushing type for use with one or more single conductor insulated cables, cadmium or zinc-plated, malleable iron, with properly sized neoprene sealing gaskets for sealing around each insulated conductor.
      a. O-Z Electrical Mfg. Co.,Inc., Type CMT
      b. Other approved

D. Precast Manholes
   1. *Precast Type [U]:* Interlocking reinforced concrete sections having interior clear dimensions not less than indicated, designed to meet or exceed AASHTO interim specification 1972, load factor design and ACI Code 318-71 (USD) where applicable, and complete with double seals at intersections, duct openings approximately as indicated, pulling irons opposite duct faces and in center of floor, opening for ground rod, equipment mounting means, and means for securing concrete throat and manhole cover frame to the reinforcing steel in the roof of the manhole or handhole.
      a. Hartford Concrete Products, Inc., Hartford City, Indiana
      b. Penn-Cast Product, Inc.
   2. Concrete. High-early type having a minimum compressive strength of 4500 PSI.
   3. Reinforcing. Grade 60 per Bell Laboratory Specification, bonded together, and provided with strapping exposed in the manhole or handhole for connection to the grounding system.
   4. Field Waterproofing Resin:
      a. Sika Corp. “Sikadur 31”
      b. Other approved
   5. Field Waterproofing Fabric:
      a. Sika Corp. “Colma Fiberglas Mesh Fabric”
      b. Other approved

E. Frames And Covers For Electric Manholes
   1. *Manhole Frame and Cover [U]:* Gray cast iron, with machine finished contact surfaces, 30 inch diameter opening, round solid cover with the word “Electric”(field verify with Brookhaven) cast in the center of the cover in large letters.
      a. Neenah R-1640-C
      b. Other approved

2. *Square Sump Frame and Grate [U]:* Gray cast iron, with machine finished contact surfaces, 12 inch square opening, square slotted cover.
    a. Neenah R-1646
    b. Other approved
3. *Round Sump Cover [U]:* Designed to fit in bell end of standard sewer pipe of size indicated, gray cast iron, heavy duty with square openings or light duty with slotted openings.
    a. Neenah R-4030 Series or R-4040 Series, respectively
    b. Other approved
4. *Sump [U]:* Vitrified clay pipe, Type VCP-ES, extra strength, bell and spigot, of size indicated, per ASTM C 700.

F. Frames And Covers For Communication Manholes
1. *Manhole Frame and Cover [U]:* Gray cast iron, with machine finished contact surfaces, 30 inch diameter opening, round solid cover with the word "COMMUNICATION" (field verify with Brookhaven) cast in the center of the cover in large letters.
    a. Neenah R-1640-C
    b. Other approved
2. *Square Sump Frame and Grate [U]:* Gray cast iron, with machine finished contact surfaces, 12 inch square opening, square slotted cover.
    a. Neenah R-1646
    b. Other approved
3. *Round Sump Cover [U]:* Designed to fit in bell end of standard sewer pipe of size indicated, gray cast iron, heavy duty with square openings or light duty with slotted openings.
    a. Neenah R-4030 Series or R-4040 Series, respectively
    b. Other approved
4. Sump: Vitrified clay pipe, Type VCP-ES, extra strength, bell and spigot, of size indicated, per ASTM C 700.

G. Cable Racks For Electric Manholes
1. Cable Racks: Hot-dip galvanized, standard, heavy duty underground type.
    a. Line Material DU1B4
    b. Underground Devices, Inc. CR31
    c. A. B. Chance Company, 1200 Series
2. Hooks: Hot-dip galvanized, standard, heavy duty, to fit racks furnished.
    a. Line Material DU1S1 through DU1S4
    b. Underground Devices, Inc. RA10
    c. A. B. Chance Company, 1200 Series
3. Insulators: High glaze, wet process white porcelain, to fit hooks furnished.
    a. Condux International 83811-00
    b. Line Material DE3U1 and DE6U1
    c. A. B. Chance Company, 1200 Series

H. Cable Racks For Communication Manholes
1. Cable Racks: Hot-dip galvanized, standard underground communication type.
    a. Condux International 83800 Series
    b. The George-Ingraham Corp. 8737 or 8747

c. Cooper Power Systems DU17B4

2. Hooks: Hot-dip galvanized standard, to fit racks furnished.
   a. Condux International 83800 Series
   b. The George-Ingraham Corp. 8710 Series
   c. Line Material DU5S1
3. Insulators: High glaze, wet process white porcelain, to fit hooks furnished.
   a. Condux International 83811-00
   b. Line Material DE11U1
   c. A. B. Chance Company, 1100 Series

I. Miscellaneous Hardware
   1. Pulling-In Irons: 7/8 inch formed steel, hot-dip galvanized.
      a. Condux International 83813-02
      b. The George-Ingraham Corp. 8220
      c. Line Material DU2T3
   2. Concrete Inserts: Continuous type, cold roll formed from No. 12 gage strip steel, galvanized, length as indicated, with cardboard or styrofoam filler.
      a. Unistrut P3000 Series
      b. B-Line Systems, Inc., B32 and B52 Series
      c. "Kindorf" D900 Series

PART 3 EXECUTION

3.1 INSTALLATION

A. Underground Duct Banks - Concrete Encased
   1. Form single conduit as specified into duct banks as shown and encase in concrete. Use molded plastic spacers. Lay conduit to grades indicated. Stagger joints 6 inches vertically and horizontally in horizontal duct runs and make joints watertight. Where it is necessary to cut a tapered end on duct, make cut with a tool or lathe designed to cut a taper to match the taper of the particular duct used. Provide end bells where ducts enter manholes.
   2. Use rigid steel conduit in lieu of conduit specified for duct banks at risers, within 5 feet of building walls, under roads and railroads, at points of strain, and at other locations as indicated. Provide conduit adapters for connection of conduit of different materials. Extend rigid steel conduit a minimum of 5 feet beyond each edge of roads and railroads. For risers, use bends having a minimum radius of 36 inches for three inch and larger conduit, and 24 inches for conduit smaller than three inch.
   3. Plug duct ends during and after construction to prevent water, mud and debris from entering duct.
   4. After a duct line has been completed, pull a standard flexible mandrel not less than 12 inches long and having a diameter approximately 1/4 inch less than the inside diameter of the conduit through each conduit, and then pull a brush with stiff bristles through each conduit to make certain that no particles of earth, sand or gravel have been left in the conduit.

B. Direct Burial Conduit
   1. Clear and final grade bottom of trench not less than 3 inches below the level at which conduit is to be installed. Provide a 3 inch minimum sand bed in bottom of trench preparatory to installing conduit. Install conduit as specified, with spacing as indicated, on the sand bed, and cover with a minimum of 3 inches of sand. Make conduit joints watertight. Use Type NS sand per SECTION 01640. Refer to SECTION 01640 for compaction methods and requirements.
   2. Where it is necessary to cut a tapered end of duct, make cut with a tool or lathe designed to cut a taper to match the taper of the particular duct used. Provide end bells where ducts enter manholes.
   3. Use rigid steel conduit in lieu of conduit specified for direct burial, at risers, within 5 feet of building walls, under roads and railroads, at points of strain, and at other locations as indicated. Extend rigid steel conduit a minimum of 5 feet beyond each edge of roads and railroads. Provide conduit adapters for connection of conduit of different materials. For risers, use bends having a minimum radius of 36 inches for three inch and larger conduit, and 24 inches for conduit smaller than 3 inch.
   4. Plug ends of conduit during and after construction to prevent water, mud and debris from entering conduit. After a run has been completed, pull a brush with stiff bristles through each conduit to make certain that no particles of earth, sand or gravel have been left in the conduit.
   5. Provide a concrete cover not less than 2 inches thick and of a width equal to the overall dimension of the installed conduit on top of the sand cover.
   6. Provide underground hazard tape 12 inches below grade and above concrete per SECTION 16050.
   7. Fill the remainder of the trench, and carefully tamp, with materials and compaction methods to suit project conditions per SECTION 01640.

C. Manholes
   1. Construct manholes of cast-in-place reinforced concrete and as indicated, or provide precast manholes as indicated on the Drawings specified. Install pulling irons in cast-in-place manholes at locations indicated. In unpaved areas, install manhole frame and cover such that top of cover (rim) is 2 inches above finish grade. In paved areas, install manhole frame and cover such that top of cover (rim) is flush with finish grade. Provide waterproofing of manholes as indicated on the Drawings. Seal opening around ground rod watertight in precast manholes.
   2. Rim elevations where indicated on DRAWINGS, are nominal. Contractor shall coordinate final tops of cover (rim) elevations of manholes with final grade. Manholes installed in unpaved areas shall have top of cover (rim) elevations placed at 2 inches above final grade.
   3. In “Electric” manholes, install concrete inserts as required and not less than 2 cable racks on each wall with additional racks as indicated and required for proper support of cables. Equip racks with hooks and insulators as required for cable support. Install one spare hook of the maximum size used on each rack. Do not provide insulators on spare hooks. Provide grounding as indicated, and ground all steel and equipment.
   4. In “Communication” manholes, install concrete inserts as required and 2 cable racks on each wall. Equip racks with 2 hooks and one insulator on each hook. Provide grounding as indicated and ground all steel and equipment.

D. Lighting Standard Foundations
   1. Construct foundations of reinforced concrete and as indicated, complete with anchors, conduit and grounding. Anchors are specified in SECTION 16500.

E. Concrete Work For Electrical Work
   1. Provide concrete work including concrete, forming, pouring and reinforcing for underground duct banks, protection of direct burial conduit, equipment foundations at grade, risers, and lighting standard foundations. Provide concrete, forming, pouring and reinforcing in conformance with requirements of SECTION 03300, except as otherwise specified. Use concrete having a minimum compressive strength of 3000 psi in 28 days, unless otherwise indicated. Use air-entrained concrete for applications exposed to the weather.

F. Waterproofing Of Manholes And Handholes
   1. Precast Manholes. Waterproof section joints, duct entrances, and joints at top and bottom of poured concrete throats as indicated on Drawing E-503.

END OF SECTION

Revision History	
Date	**Rev. No.**
A	0
B	0
D	0
E	0
F	0
02-19-09	0

EY/ca
C:\d\timsdatasf\BROOKHAVEN_NATIONAL_LABORATORY\SF070003\200-PROJEXEC\280-SPEC\16402.doc