

INDEX TO
SECTION 16000
WIRES AND CONDUITS

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
PART 1 – GENERAL.....		1
1.01	SCOPE	1
1.02	CODES AND PERMITS	1
1.03	RELATED DOCUMENTS	1
1.04	SUBMITTALS	2
1.05	QUALITY ASSURANCE AND PRODUCT TECHNICAL SUPPORT.....	2
PART 2 – PRODUCT DESCRIPTION		2
2.01	ELECTRICAL WIRE AND WIRING	2
2.02	ELECTRICAL CONDUIT / RACEWAY AND WIREWAYS	3
PART 3 – TESTING, INSPECTION, AND FINAL ACCEPTANCE.....		4
3.01	EQUIPMENT START-UP / PROGRAMMING	4
3.02	DOCUMENTATION AND END-USER OPERATING AND MAINTENANCE TRAINING.....	5
PART 4 – WARRANTY.....		5

SECTION 16000

WIRES AND CONDUITS

PART 1 – GENERAL

1.01 SCOPE

- A. This section describes the requirements for acceptable installations of wire, conduit, wire ways and conduit assemblies which are not described in the related documents listed in this document.
- B. The standards of NFPA 70 (National Electrical Code), IEEE, and NEMA; along with all local and state requirements shall, as applicable, be modified to conform to the specific needs of the City of Savannah Wastewater Conveyance Department. Such modifications shall be to adjust the requirements to a more stringent level. The requirements of the standards shall not be reduced in any way by the requirements of this document.

1.02 CODES AND PERMITS

All electrically related work, installations, equipment, and devices shall conform to the requirements of the following listed standards as a minimum. The electrical design engineer shall be permitted to increase/enhance the requirements but SHALL NOT be permitted to decrease/reduce these requirements.

- A. NFPA 70 National Electrical Code
- B. NEMA Standards Publication 250-2008
- C. Local utility company standards and installation guidelines with respect to service entrance and metering

1.03 RELATED DOCUMENTS

The below listed documents shall be used in conjunction with this section. In the event of conflict between the requirements of this document and the related documents; this specification document shall govern.

- A. Specification Section 11100
- B. Specification Section 16400
- C. Specification Section 16482
- D. Specification Section 16620

The most current revision at the time of project approval shall apply. Specification revisions become official once posted on the City of Savannah web site.

1.04 SUBMITTALS

The below listed drawings and product data, as applicable, shall be submitted:

- A. Equipment outline drawings showing elevation, plan, and interior views, weight, cable/wire entry points, and mounting bolt patterns.
- B. Device specifications to include performance data and code compliance certification information related to NFPA 70, IEEE Standards, and IEC/EN Standards.
- C. Dimensional and location “maps” of conduit wire ways routed concealed within walls or below grade.

1.05 QUALITY ASSURANCE AND PRODUCT TECHNICAL SUPPORT

- A. All devices shall be newly manufactured and of the most recent production model which meets or exceeds the performance requirements of this specification.
- B. All products shall be UL approved for their application requirements, installation location, and installed in compliance with NFPA 70 and IEEE Standards.

PART 2 – PRODUCT DESCRIPTION

2.01 ELECTRICAL WIRE AND WIRING

- A. Shall be 90°C copper stranded THHN/ THWN/ THEN2; rated for use at 600VAC or lower voltage as described in NFPA 70 Article 310 and shall meet or exceed all associated specifications therein to include construction details, insulation jacket, ampere capacity, physical dimensions/diameters, and allowable location(s) for installation.
- B. All equipment grounding conductors shall have a green insulation jacket and shall conform to the standards of NFPA 70 Article 200 and 250. Green insulation jacketed conductors shall not be utilized for any purpose other than grounding.
- C. Shielded wiring conductors/cables shall be installed in accordance with NFPA 70 and IEEE standards associated with electrical “noise” and EMI interference elimination/reduction for all interconnecting wiring susceptible to such interference as shown on the contract electrical drawings.
- D. All shielded wiring shall be kept to the shortest length possible and shall be continuous from origination point to termination point. Shielded wire shall not be spliced.

- E. All wiring conductors sized AWG-8 or smaller shall be marked for identification with unique identification numbers and/or letters at both ends. Products of Ideal (Wire Marker Rolls or Wire Marker Booklets) are acceptable.
- F. Power distribution (load current carrying) conductors shall have color coded insulation as shown below. Conductors of AWG-4 or larger shall be acceptable with standard black insulation jackets providing they are clearly marked at both ends with colored “phasing” tape in the appropriate color.

277/480VAC – Phase A -----Brown
 277/480VAC – Phase B -----Orange
 277/480VAC – Phase C -----Yellow
 277/480VAC – Neutral -----Gray

115/208VAC – Phase A -----Black
 115/208VAC – Phase B -----Red
 115/208VAC – Phase C -----Blue
 115/208VAC – Neutral -----White

120/240VAC – Phase A -----Black
 120/240VAC – Phase B -----Orange (High Leg)
 120/240VAC – Phase C -----Red
 120/240VAC – Neutral -----White
 (NOTE: “High Leg” shall be identified with Orange over Red color coding)

2.02 ELECTRICAL CONDUIT / RACEWAY AND WIRE WAYS

All conduit raceway and/or wire-ways shall conform the requirements of NFPA 70, UL, and NEMA standards, as applicable, with the additional requirements as listed below:

- A. All conduit installed outdoors and above grade shall be Rigid Aluminum.
- B. All conduit installed below ground shall be Rigid Schedule 80 PVC.
- C. Minimum conduit size shall be ¾”.
- D. Where flexible conduit is required by system installations such as the Emergency Power System, it shall be of metallic liquid-tight style. Non-metallic liquid-tight style flexible conduit such as “Carflex” is not permitted.
- E. Outdoor penetrations of enclosures or equipment housings for conduit entry shall be made with Meyers Hub or threaded hubs.

- F. Penetrations of building/wet well structures shall be made with water tight devices and/or techniques. Provide high strength grout or link seal.
- G. Where aluminum conduit devices penetrate concrete, brick, cinder block, or other such materials they shall be installed with corrosion protection and the penetration area shall be restored to its original water-tight integrity. Corrosion protection shall be two coats of 3M Scotchrap pipe primer and two overlapping layers of Scotchrap Temflex 1100 Type. Provide high strength grout or link seal.
- H. All PVC conduit and conduit fittings which are exposed to sunlight shall be painted with two (2) coats of outdoor rated paint. Apply on coat of Rust-Oleum Plastic Primer (SKU 249323) and one coat of Rust-Oleum Specialty Paint for Plastic, Shell White (SKU 211364).
- I. Outdoor installations shall only penetrate the bottom or side of the enclosures. Top and side penetrations not permitted.
- J. Indoor conduit installations shall be made utilizing metallic EMT type conduit and steel compression fittings which shall meet or exceed the standard NEMA 1.
- K. Service grounding shall be provided in accordance with the National Electrical Code, NFPA 70. Bond the neutral at the service disconnect, provide a bonding jumper and extend a grounding electrode conductor in Sch.80 PVC conduit to the grounding delta.
- L. All branch circuit feeder and circuit conduits shall be provided with a green insulated equipment grounding conductor. Use of the raceway as a grounding path will not be accepted or approved.
- M. Bond all metal enclosures, equipment frames, hoist frames and other metal parts of the pump station. Provide, where necessary, metal braid bonding jumpers between steel structures.

PART 3 – TESTING, INSPECTION, AND FINAL ACCEPTANCE

3.01 EQUIPMENT START-UP / PROGRAMMING

- A. The Contractor shall coordinate as necessary to retain the technical services of factory certified personnel to ensure that all assemblies/sub-assemblies are correctly installed, programmed per end-user requirements, and acceptable for commissioning for warranty purposes.
- B. The equipment systems and sub-systems operational capabilities shall be demonstrated at the operational site to the satisfaction of the Inspector or his/her representative as well as to the Wastewater Conveyance Maintenance Superintendent or his/her representative.

3.02 DOCUMENTATION AND END-USER OPERATING AND MAINTENANCE TRAINING

- A. A minimum of one (1) copy of applicable operating and maintenance instructions shall be provided in printed form to the Wastewater Conveyance Department Maintenance Superintendent or his/her representative in printed form as an integral part of the final acceptance.
- B. The Contractor shall coordinate with all applicable vendors and the City of Savannah Wastewater Conveyance Department Maintenance Superintendent to schedule and provide on-site operating and maintenance training for City of Savannah personnel.

PART 4 – WARRANTY

Warranty provisions shall be as described in Specification 11100 as supplemented in this document.

END OF SECTION 16000