PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work in Division 16 consists of all electrical work associated with the installation of the new sewer level remote telemetry (SLRT) enclosure.

B. Provide complete systems in accordance with the intent of these Contract Documents.

1. Coordinate the details of equipment and construction for all specification divisions which affect the work covered under this division.

2. Furnish and install all incidental items not actually shown or specified, but which are required by standard industry practice to provide complete functional systems.

C. Intent of Drawings:

1. Electrical plan drawings show only general locations of equipment, devices, and raceways, unless specifically dimensioned.

2. The Contractor shall be responsible for the proper equipment layout, and the routing of raceway, subject to prior review by the Owner’s Representative.

1.02 REFERENCES

A. Wherever the requirements of the Specifications or Drawings exceed those of the governing codes and regulations listed below, the requirements of the Specifications or Drawings shall prevail.

B. Comply with applicable standards as specified here and in each Division 16 Sections.

1. National Electrical Code (NFPA 70)

2. Institute of Electrical and Electronics Engineers (IEEE)

3. National Electrical Contractor's Association (NECA) Standard of Installation.

4. National Electrical Manufacturers Association (NEMA)

5. Underwriters Laboratories, Inc. (UL)

6. Uniform Building Code (UBC)

7. American National Standards Institute (ANSI)

8. Oregon State Industrial Safety and Health Administration

9. Oregon Electrical Specialty Code and Local Ordinances

10. City of Portland, Environmental Services, Wastewater Treatment Group-Control System Standards. A copy of these standards may be downloaded from the Internet or obtained from:

    Mr. Dave Remillard
    Columbia Blvd. Wastewater Treatment Plant
    5001 N. Columbia Blvd.
    Portland, OR 97203-2098
    Telephone: 503-823-2400

    Internet Address to download Control Systems Standards: "www.cleanrivers-pdx.org/tech_resources/2003_css_manual.htm"

1.03 SUBMITTALS

A. Submittals shall be made in accordance with Division 1 Section 01300.

B. Submittal shall be identified by the specified equipment number and specification section.

C. All submitted material shall include 6 copies with each item labeled.

D. Provide a list of local suppliers, addresses and phone numbers on each item.

1.04 AS-BUILT (RECORD) DRAWINGS

A. Project record shall be maintained and submitted in accordance with Division 1 Section 01720.

B. Submit the following drawings as a minimum for all the equipment involved and changed in this contract.

1. "As-Built" layout drawings, showing equipment, raceway, junction boxes, etc. Buried conduit locations referenced to permanent landmarks.

C. As-Built shop drawings: revise manufacturer's shop drawings to show any construction changes. Prior to final acceptance, deliver one complete set to the Owner's Representative for review.

1.05 PERMITS

A. Obtain all necessary electrical permits, licenses and inspections and bear the cost that will be required for the electrical construction work.

1.06 TEMPORARY POWER

A. Provide all necessary temporary power at site at no cost to Owner.

1.07 LOCATIONS

A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located, as defined in Paragraph B herein.

B. Definitions of Types of Locations:

1. Wet Locations: All locations exposed to the weather, and all spaces wholly or partially underground.

2. Hazardous Locations: All areas in which fire or explosion hazards may exist, normally or accidentally, due to flammable gases or vapors.

1.08 COORDINATION

A. Coordinate the electrical work with the other trades, code authorities, utilities and the Owner.

PART 2 PRODUCTS

2.01 GENERAL

A. All material and products shall be new and unused.

B. Electrical equipment and material shall be listed and labeled for the purpose of its use by UL, Factory Mutual, or ETL. Materials or assemblies that do not bear an independent testing label shall meet the special approval criteria established by the State and local electrical authorities.

C. Where the finish of equipment or material is referenced or stated, provide the finish exactly as shown or specified. Where no color or finish is listed, provide the manufacturer's standard finish, suitable for the environment intended, and as approved by the Owner’s Representative.

2.02 SEISMIC REQUIREMENTS

A. All Electrical equipment installation shall withstand Seismic Zone 3 forces, as defined by Uniform Building Code. All equipment and material shall be adequately restrained to resist seismic forces.

PART 3 EXECUTION

3.01 GENERAL

A. Construction

1. The work shall be performed in accordance with NEC, local regulatory codes, drawings, and in accordance with these specifications.

2. Unless otherwise detailed or dimensioned, Electrical layout drawings are diagrammatic. Coordinate the location of Electrical material or equipment with the work.

3. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Owner reserves the right to require minor changes in location of equipment, prior to roughing-in, without incurring any additional costs or charges.

4. Install Electrical equipment or devices together with all required interconnections as shown on the drawings and as required.

5. All proposed labels and tags shall be submitted to the Owner's Representative for approval, prior to fabrication.

B. Housekeeping

1. Before final acceptance, repair all scratches or defects in finish of the equipment using spray painting, after properly preparing the surface. Repair all scratches on Owner supplied equipment, using spray painting, after properly preparing the surface. Only identical paint furnished by the equipment manufacturer shall be used for such purposes.

2. Clean the work area at the end of each day to maintain safe and orderly working conditions.

3. Clean up entire work area at the completion of project and restore all disturbed features to their original condition.

4. Gather up and dispose of all debris daily.

C. New Equipment:

1. Care shall be exercised in the installation of all equipment to avoid damage or disfigurement of any kind. All equipment shall be protected from dust and moisture prior to and after installation.

2. Repair any damage to equipment caused by the failure to protect the equipment as outlined herein.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes work necessary to furnish and install complete electrical materials and systems.

1.02 REFERENCES

A. This section references the latest revision of the following documents, where the specifications are more stringent than the listed documents, the requirements under these specifications shall prevail.

1. NEC: National Electrical Code (NFPA 70)
2. UBC: Uniform Building Code
3. NEMA: National Electrical Manufacturers Association
4. JIC: Joint Industrial Council
5. ANSI: American National Standards Institute
6. CITY OF PORTLAND, ENVIRONMENTAL SERVICES: Control Systems Standard

1.03 LISTING AND LABELING

A. Electrical equipment and material shall be listed and labeled for the purpose for which it is used by Underwriters Laboratories.

1.04 SUBMITTALS

A. The following shall be submitted prior to construction for approval by Owner’s Representative:

1. Manufacturer's literature with specific product identified.

PART 2 PRODUCTS

2.01 MANUFACTURERS NAME

A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers may be considered, if equal.

2.02 JUNCTION AND PULL BOXES

A. For underground installation, provide NEMA 250, Type 4X, outside-flanged, recessed cover box for flush mounting, watertight box.

B. Use special boxes where indicated on the Drawings.

PART 3 EXECUTION

3.01 JUNCTION AND PULL BOXES

A. Furnish and install pull boxes where necessary in the raceway system to facilitate conductor installation. Provide pull boxes to limit the number of directional changes of conduit to total not more than 270 degrees in any run between pull boxes. Conduit runs shall be limited to 200 feet, less 25 feet for every 90 degrees of change in direction

B. Types to be installed: Use boxes of the types listed for specified locations under article JUNCTION AND PULL BOXES.

C. Installation

1. Install boxes for conduits under grade flush with finished grade in locations outside of paved areas, roadways, or walkways.

3.02 DEVICE PLATES

A. Unless specifically cited on the Drawings, device plates shall be as follows:

Locations	Plate Type
EXTERIOR	
General Junction Box	Metal Galvanized, Weatherproof, Corrosion Resistant
General Receptacle or Switch	Weatherproof, Corrosion Resistant

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This section specifies raceways, fittings and supports for electrical conductors to be provided for power, instrumentation, and grounding systems.

1.02 REFERENCES

A. This section references the latest revisions of the following documents. They are a part of this section insofar as specified and modified herein. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail.

Reference	Title
ANSI C80.1	Rigid Steel Conduit, Zinc Coated
FED SPEC	Conduit, Metal, Rigid
WW-C-581E	Coupling, Elbow, and Nipple, Electrical Conduit; Zinc Coated
NEMA TC 2	Electrical Plastic Tubing (EPT) and Conduit (EPC 40 and EPC 80)

CITY OF PORTLAND, ENVIRONMENTAL SERVICES: Control Systems Standard

1.03 LISTING AND LABELING

A. All material shall be listed and labeled for the purpose for which it is used by Underwriters Laboratories.

1.04 SUBMITTALS

A. The following shall be submitted prior to construction, for approval:

1. Manufacturer's literature with specific product identified.

2. Submit product data including, but not limited to: raceways, fittings, pullcord, tags and labels, etc.

PART 2 PRODUCTS

2.01 RACEWAY

A. Steel Conduit

1. Galvanized Rigid Steel Conduit (GRS): Rigid steel conduit shall comply with ANSI C80.1 with smooth finished surfaces. Conduit shall be hot-dip galvanized inside and out with zinc coated threads.

2. Fittings

   a. Locknuts shall be extra heavy electrogalvanized steel for sizes through 2 inches. Locknuts larger than 2 inches shall be electrogalvanized malleable iron. Bushings shall be electrogalvanized malleable iron with insulating collar. Grounding bushings shall be locking type and shall be provided with a lay-in compression lug for ground cables. Unions shall be electrogalvanized ferrous alloy type Appleton UNF or UNY, Crouse-Hinds UNF or UNY, or equal. Threadless fittings are not acceptable. Conduit bodies shall be galvanized ferrous alloy type with screw taps for fastening covers. Gaskets shall be made of neoprene.

   b. Expansion fittings for embedded runs shall be watertight and shall be provided with an internal bonding jumper. The expansion material shall be neoprene and shall allow for 3/4-inch movement in any direction.

B. PVC Coated Galvanized Rigid Steel Conduit (PVC/GRS): Conduit shall comply with ANSI C80.1 and NEMA RN 1, be hot-dipped, galvanized inside and out with zinc coated threads. The plastic coating on the exterior of the conduit shall have a minimum thickness of 40 mils. The interior of the conduit shall have urethane coating of thickness 2 mils minimum. Approved manufacturers: Thomas & Betts, Robroy Industries, Occidental Coating Co. or approved equal.

C. Rigid Nonmetallic Conduit (PVC 40): Rigid nonmetallic conduit shall meet the requirements of NEMA TC2 for high impact polyvinylchloride (PVC), Schedule 40. Fittings used with PVC Conduit shall be PVC solvent weld type. Nonmetallic conduit shall be UL listed for their respective applications. Minimum size shall be 1-inch embedded. Conduit shall be sunlight resistant and suitable for 90 degrees C conductors and exposed locations.

2.02 BOXES AND FITTINGS

A. Provide junction boxes, device boxes, as specified under Section 16050.

B. Conduit fittings for nonhazardous locations shall be cast ferrous alloy unless specified otherwise.

C. Conduit fittings, sealing fittings, unions, and hubs for hazardous locations shall be of malleable iron, with 40% fill per National Electrical Code; Appleton, Crouse-Hinds or approved equal.

D. Threaded hubs for connection of conduit to junction, device or terminal boxes shall be made of cast ferrous alloy, electroplated with zinc and shall have insulated liner and insulating bushings. The hubs shall utilize a neoprene O-ring and shall provide a watertight connection.

2.03 RACEWAY SUPPORTS

A. Conduit Supports: Hot-dip galvanized framing channel shall be used to support groups of conduit. Individual conduit supports shall be 1-hole galvanized malleable iron pipe straps used with galvanized clamp backs or nesting backs.

2.04 WARNING TAPE

A. The tape shall be heavy-gauge, yellow, plastic, 6" minimum width for use in trenches. Tape shall be made of material resistant to corrosive soil. Warning tape shall be manufactured in detectable construction and shall have a printed warning that an electric circuit is located below the tape. Approved manufacturer's and type: ITT Blackburn Type YT, Griffolyn Co., Terra-Tape or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION/ APPLICATION

A. General

1. Conduit Runs Between Boxes: Limit the number of directional changes of the runs of conduit to total not more than 270 degrees in any run between pull boxes. Conduit runs shall be limited to 200 feet, less 25 feet for every 90 degrees of change in direction. Bends and offsets shall be made with a hickey or conduit bending machine, or shall be factory preformed bends. Turns shall be made with conduit bends or cast metal fittings if specifically approved by the Owner. Welding, brazing or otherwise heating of conduit is not acceptable.

2. Junction and Pull Boxes: Where required for pulling cable and as necessary to meet NEC, provide cast/sheet steel junction or pull boxes whether or not specifically shown on Drawings.

3. Conduit Terminations: Conduit entering all other boxes shall be terminated with a threaded hub. Surface-mounted cast boxes and nonmetallic enclosures shall have threaded hubs. Joints shall be made with standard couplings or threaded unions. Metal parts of nonmetallic boxes and plastic coated boxes shall be bonded to the conduit system. Running threads shall not be used in lieu of conduit nipples, nor shall excessive thread be used on any conduit. The ends of conduit shall be cut square, reamed, and threaded straight threads. Metallic raceway joints shall be electrically continuous by use of conductive joint compounds, Thomas & Betts "Kopr-Shield" or approved equal.

B. Conduit Locations and Requirements

1. Unless otherwise specified, scheduled conduit shall be installed in locations as specified in Table A below.

Table A

Conduit Locations

Conduit type	Location
1. PVC Coated Galvanized Rigid Steel	All conduit to the Shaft

2. Intermediate metal conduit (IMC)	Not allowed.
2. Intermediate metal conduit (IMC)	Not allowed.
3. Rigid nonmetallic, Schedule 40 (PVC 40)	Exposed and direct buried to PGE pole
4. Electrical metallic tubing (EMT)	Not allowed.
6. Flexible metal	Not allowed.
7. Liquidtight flexible non-metallic	Not allowed.

C. Direct Buried Conduit

1. Conduit shall be encased and embedded in 4" of clean sand on all sides of the raceway.

2. Provide warning tape 12-inches above the direct buried raceway.

D. Underground Raceway Installation

1. Slope raceways entering manholes and handholes to drain towards them.

2. Install raceways at a depth of 36" below final grade unless otherwise indicated.

3. Install yellow warning tape 12" above direct buried raceways.

3.04 MANDRELLING

A. A mandrel and a stiff-bristle brush, correctly sized for each size of conduit shall be pulled through the raceways prior to installing wires or pull cords. Mandrelling shall be done in the presence of the Owner’s Representative.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This section specifies wires and cables rated at 600-V used for power.

1.02 REFERENCES

A. This section references the latest revisions of the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and of those of the listed documents, the requirements of this section shall prevail.

Reference	Title
ASTM B3	Soft or Annealed Copper Wire
ASTM B8	Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard or Soft
ASTM B33	Tinned soft or Annealed Copper Wire for Electrical Purposes
ICEA S-68-516	Ethylene Propylene Rubber Insulated
AEIC -6	Ethylene Propylene Rubber Insulated 5-69kV
UL 1072	Distribution of Electrical Energy

CITY OF PORTLAND, ENVIRONMENTAL SERVICES: Control Systems Standard

1.03 LISTING AND LABELING

A. Wires and cables shall be listed and labeled for the purpose for which it is used by Underwriters Laboratories.

1.04 SUBMITTALS

A. The Contractor shall provide the following submittals prior to construction:

1. Manufacturer's product data on cables and splicing materials.

PART 2 PRODUCTS

2.01 GENERAL

A. Wire and cables shall be identified on the outer covering with manufacturer's name, cable size, number of conductors, type of insulation, type of jacket, cable type, and

voltage rating. Identifying information shall be printed every 3 feet in a color contrasting with the cable jacket. Refer to the drawings for cable size.

2.02 600 - VOLT WIRE/CABLE

A. SLRT Power Wire

1. All conductors shall be stranded copper. The minimum size for power conductor shall be No. 10 AWG. All conductors shall have Type XHHW or XHHW-2 insulation.

B. Identification (Color Coding)

1. All 600-V wiring used in power circuits shall be color coded in accordance with the following table. Wire shall be factory colored:

Use	Cable	Color
Single-Phase, 120-V power	Phase A	Black
	Ground	Green
	Neutral	White

C. Sources

1. The Okonite Company, Rome Cable, Southwire or approved equal.

2.03 SPLICING AND TERMINATION MATERIALS

A. 600 V Wire and Cable Connectors

1. Connectors for wire sizes No. 10 AWG and smaller shall be compression type. Connectors shall be tin-plated high conductivity copper. Connectors for wire sizes No. 8 AWG and larger shall be 1-hole lugs; Mechanical clamp, spade crimp lugs, dimple, screw-type connectors are not acceptable.

PART 3 EXECUTION

3.01 GENERAL

A. Raceway construction shall be complete and protected from the weather before cable is placed. Wire and cable shall not be pulled into conduits until conduits have been cleaned.

B. Pulling wire and cable into conduit shall be completed without damaging or putting undue stress on the cable insulation. Soapstone, talc or UL listed pulling compounds are acceptable lubricants for pulling wire and cable. Grease is not acceptable.

C. Splices are not permitted.

3.02 WIRE AND CABLE TERMINATION

A. Power conductors No. 10 AWG and larger shall be terminated using 1-hole or two-hole lugs.

B. Terminals and connectors shall be installed with the compression tool recommended by the terminal manufacturer.

3.03 WIRE AND CABLES (600-VOLT)

A. Inspect all wires and cables for damage prior to installation. Damaged cable shall not be installed.

B. In all metallic and non-metallic conduits where conductors are installed, a separate ground wire shall be provided, sized in accordance with the NEC and installed in accordance with these specifications.

C. Handholes and conduits shall be thoroughly dewatered and shall be kept dry until any allowable cable splicing has been performed.

D. Slack shall be provided in junction boxes, handholds and manholes. Slack shall be sufficient to allow cables or conductors to be routed along the walls of the box.

E. Stranded conductors shall be terminated as described in Paragraph 3.02 except where terminals will not accept such terminations. In these cases, the conductors shall be terminated directly on the terminal block.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This section covers the work necessary to provide electrical service for a new Sewer Level Remote Telemetry (SLRT) enclosure.

B. The Contractor shall furnish and install the raceway and wire to the PGE service connection point and to the service main circuit breaker installed by the Contractor on the exterior of the SLRT cabinet.

C. PGE shall terminate the service conductors at the PGE service connection point.

D. Coordinate all electrical service work with a PGE Service Coordinator. Contact the PGE Service Center at 503-736-5450.

E. The City will pay the utility for all utility charges required for new services.

1.02 REFERENCES

A. This section references the latest revision of the following documents. Where the specifications are more stringent than the listed documents, the requirements under these specifications shall prevail.

1. NEC: National Electrical Code (NFPA 70)

2. NEMA: National Electrical Manufacturers Association

3. UL: Underwriters Laboratories

4. Oregon Electrical Specialty Code

1.03 LISTING AND LABELING

A. Electrical equipment and material shall be listed and labeled for the purpose for which it is used by Underwriters Laboratories.

1.04 SUBMITTALS

A. The following shall be submitted prior to construction, for approval.

1. Manufacturer’s literature with specific product identified.

PART 2 PRODUCTS

2.01 SERVICE (UTILITY) ENCLOSURE WITH MAIN DISCONNECT

A. All equipment to be used for the electric service connection shall satisfy the requirements of PGE, as specified under "Electric Service Requirements (ESR) – Portland General Electric".

B. Provide a thermal-magnetic circuit breaker as the disconnect device. The service disconnect shall be rated for 120VAC, 1-phase, 20 amperes, 22 KAIC minimum. Verify the fault current level at the SLRT site with PGE, prior to purchase and increase short circuit rating as required.

2.02 RACEWAY

A. The raceway shall be as specified under Section 16110 RACEWAY.

2.03 WIRES AND CABLES

A. Wires and cables shall be as specified under Section 16120, WIRE AND CABLE.

2.04 SERVICE ENTRANCE GROUND

A. Provide service entrance ground system per NEC to achieve less than 25-ohm resistance to ground.

B. Grounding shall be as specified under 16450, GROUNDING.

PART 3 EXECUTION

3.01 SERVICE (UTILITY) ENCLOSURE WITH MAIN DISCONNECT

A. Mount service main breaker on the exterior of owner furnished SLRT cabinet.

3.02GROUNDING

A. Install grounding as shown on the Drawings and specified under Section 16450, GROUNDING.

3.03 TRENCHING

A. All trenching from the PGE service connection point to the main circuit breaker shall be performed by a PGE approved contractor.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This section specifies grounding electrical equipment, exposed non-energized metal surfaces of equipment, metal structures, and instrumentation system grounding.

B. Furnish all labor, material, tools and services necessary for the installation, connection and testing of all grounding as specified herein and as shown on the drawings.

1.02 REFERENCES

Reference	Title
B 228	Copper Clad Steel Conductor
ASTM B 3	Specification for Soft or Annealed Copper Wire
ASTM B 187	Specification for Copper Bus Bar, Rod, and Shapes
NFPA 70	National Electrical Code (NEC)

1.03 SUBMITTALS

A. The Contractor shall provide the following submittals prior to construction:

1. Manufacturer's product data on ground rods, ground cable, and clamps.

1.04 UNDERWRITERS LABORATORIES, INC.

A. Unless otherwise specified, electrical equipment and material shall be listed and labeled for the purpose for which it is used by the Underwriters Laboratories, Inc. (UL).

PART 2 PRODUCTS

2.01 CABLE

A. Ground cable shall be soft drawn bare copper, concentric stranded as specified. If cable sizes are not specified or shown, the minimum sizes shall be as follows:

Exposed metal No. 2 AWG

B. Single insulated conductors shall conform to the requirements of Section 16120 for 600-Volt insulated conductors. Provide green insulation for all grounding conductors.

2.02 GROUND RODS

A. Ground rods shall be copper clad steel, 3/4-inch diameter and 10 feet long conforming to ASTM B 228. Rods shall have threaded type removable caps so that extension rods of same diameter and length may be added where necessary.

2.03 EXOTHERMIC AND COMPRESSION CONNECTORS

A. Connection to ground rods and buried connections shall be done by exothermic weld connectors. Exothermic connectors shall be manufactured by Thermoweld, Caldweld, or approved equal. Utilize compression type ground connectors for accessible connections only. Compression type ground connectors shall be manufactured by Burndy or approved equal.

2.04 BOLTED CONNECTORS

A. Lugs shall be suitable for attaching a ground cable to equipment or metallic surfaces, and shall be NEMA 2-hole, compression type, tin or silver plated copper, hydraulic tool applied, as manufactured by Thomas and Betts, Burndy, or approved equal.

B. Bolts and miscellaneous hardware for grounding shall be silicon bronze.

2.05 GROUNDING JUMPER

A. Jumpers shall be tin-plated copper, braided, and flexible.

PART 3 EXECUTION

3.01 GENERAL

A. Embedded and buried ground connections shall be made by exothermic connections. Embedded and buried connections shall be prepared in accordance with the manufacturer's instructions. Exposed ground connections to equipment shall be made by bolted clamps unless otherwise specified. No solder shall be used in any part of the ground circuits.

B. Grounding conductors which are extended beyond concrete surfaces for later connection shall be extended a sufficient length to reach the final connection point without splicing. Minimum extensions shall be 3 feet. Grounding conductors which project from a concrete surface shall be located as close as possible to a corner, protected by conduit, or terminated in a flush ground plate. Exposed grounding conductors shall be supported by noncorrosive metallic hardware at 4-foot intervals or less.

C. Ground conductors entering enclosures shall be bonded together, to the enclosure if it is metallic, and to metallic raceways within the enclosure. Prior to making ground connections or bonds, the metal surface at the point of connection shall be cleaned.

D. Compression-type lugs shall be used in accordance with manufacturer's recommendations.

E. When making bolted connection to aluminum or galvanized structures, apply a corrosion inhibitor such as Penetrox A to all contact surfaces between cable connector, and surface of structure.

F. Bury ground rods vertically with rod top a minimum of two feet below grade or with rod top terminated in a ground well. If extensive rock formation is encountered, the Contractor shall inform the Owner's Representative and relocate the ground rods, or provide supplemental ground rods, as directed by the Owner's Representative. Supplemental ground rods are those which are needed in addition to the grounding system as shown or specified.

G. Grounding conductor shall not be used as a system neutral.

H. Ground any metallic fence installed under this Contract that is within 10 feet of electrical equipment.

I. Grounding system shall be provided in compliance with the NEC.

3.02 RACEWAY GROUND

A. Metallic conduits shall be assembled to provide a continuous ground path. In addition, all conduits shall contain an insulated ground conductor sized in compliance with NEC. Metallic conduits shall be bonded using insulated grounding bushings. Grounding bushings shall be connected to the grounding system using conductors sized in compliance with NEC. Nonmetallic conduits shall contain an insulated ground conductor sized in compliance with the NEC.

3.03 EQUIPMENT AND ENCLOSURE GROUNDS

A. Electrical and distribution equipment shall be connected to the ground system. Cables shall be sized as specified or shown. Grounded equipment includes the SLRT cabinet and the communications antenna.

B. Non-electrical equipment with metallic enclosures within 20 feet of electrical equipment shall be connected to the grounding system.

3.04 FIELD TESTS

A. Test in the owner's representative's presence the ground resistance of the grounding system. Main breaker ground resistance shall be less than 25 ohms to ground. Verify ground continuity for the SLRT cabinet and communications antenna.

END OF SECTION