

1. General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for communications equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect communications equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2. Products

2.1 TELEPHONE WIRE

- .1 Heavy duty drop wire: 3 No. 14 AWG solid hard drawn copper, lead coated, brass plated conductors with styrene butadiene rubber insulation, neoprene jacket twisted in to triple, designed to connect open wire line to cable terminals.
- .2 Service wire: 4 No. 22 AWG solid annealed copper conductors with polyethylene insulation, spiral four lay-up, inner jacket polyvinyl chloride, close serving of flat galvanized steel wire armour, outer jacket of polyvinyl chloride designed for buried service connections.
- .3 Underground wire: 2 No.19 AWG solid annealed copper conductors laid parallel, polyethylene insulation, close serving of flat galvanized steel wire armour, jacket of polyvinyl chloride designed for buried service connections.
- .4 Ground wire: 1 No. 6 AWG solid stranded annealed copper conductor with polyvinyl chloride insulation designed for ground connections to protect cable terminals and protectors.

2.2 COAXIAL CABLES

- .1 Semi-air-dielectric coaxial cable: centre conductor No.10 AWG solid copper, insulation of polyethylene discs 2.16 mm thick, spaced 25 mm apart, outer conductor of longitudinal interlocking copper tape 0.30 mm thick, rated impedance 75 ohms shield of two spiral steel reinforcing tapes and protective covering of:

- .1 Longitudinal aluminum tape sealed to medium density polyethylene jacket designed for main feeder used in ducts.
- .2 Inner jacket of polyethylene, aluminum tape applied longitudinally, corrugated steel tape overlapped and soldered, flooding compound and outer jacket of polyethylene designed for main feeder used for installation in trench.
- .2 Foam-dielectric coaxial cable: centre conductor No.7 AWG solid copper, insulation of foam expanded polyethylene and outer conductor of aluminum, rated impedance 75 ohms designed as main feeder cable for CATV system with protective covering of viscous adhesive flooding compound and medium density polyethylene sheath is suitable for installation in trench locations that are damp.
- .3 Foam-dielectric coaxial cable designed for distribution cable in CATV system: center conductor No. 10 AWG solid copper, insulation of foam (expanded) polyethylene and outer conductor of aluminum with covering of viscous flooding compound and medium density polyethylene sheath is suitable for burial in trench.
- .4 Coaxial drop wire: centre conductor No. 16 AWG copper-covered steel, polypropylene foam insulation, medium density polyethylene skin, two longitudinal drain wires for shielding continuity, outer conductor and shield of polyolefin-coated aluminum tape, and outer jacket of polyvinyl chloride, designed for use between distribution cables and building.

2.3 FIBER OPTIC CABLE AND ACCESSORIES

- .1 Supply and install single mode 9/125 micron fiber optic cable in areas as shown on the New Fiber Network Diagram drawings. Cable manufacturer shall be Belden Inc., Corning Optical Communications LLC, or approved equal.
- .2 Supply and install one 6 pair fiber optic patch panel in the PLC control panel located on the Main Floor in the NTBU43+000 Exit Kiosk.
- .3 Supply and install fiber optic patch panels as required and as shown on the New Fiber Network Diagram drawings.
- .4 Label all fiber optic patch panels, jacks and fiber optic cabling at each end.

3. Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for communications equipment installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative unacceptable conditions immediately upon discovery.

3.2 INSTALLATION – TELEPHONE WIRE AND COAXIAL CABLE

- .1 Install telephone drop wires from pole lines to buildings using drop wire hooks and cable clamps at pole and at building.
- .2 Install aerial armoured cables on pole lines by:
 - .1 Anchoring cable to first pole.

- .2 Stringing cable along pole line.
- .3 Tightening cable to achieve correct sag using wire rope sockets or pulling eyes to protect outer sheath.
- .4 Anchoring cable progressively to each pole until last pole is reached.
- .3 Install armoured cables by direct burial using:
 - .1 Cable plow.
 - .2 Trench.
- .4 Install armoured cables in ducts using wire rope sockets or pulling eyes to protect outer sheath.
- .5 Install telephone service wire between pedestal terminals and building by direct burial in trench.
- .6 Install telephone ground wires from pedestals and protectors.
- .7 Install main feeder coaxial cable on pole line or in ducts.
- .8 Install main feeder coaxial armoured cable as indicated by direct burial in trench.
- .9 Install coaxial drop wire from terminal block on pole to buildings, as indicated, using drop wire hooks and cable clamps at pole and at buildings.
- .10 Install composite video cables:
 - .1 On pole lines by anchoring cable to first pole, stringing cable along pole line, tightening cable to achieve correct sag using pulling eyes to protect outer sheath, and anchoring cable to each pole until last pole is reached.
 - .2 By direct burial in trench.
 - .3 In ducts using pulling eyes to protect outer sheath.

3.3 TESTING

- .1 Test all conductors for opens, shorts, or grounds. Resistance values shall not be less than those recommended by the cable manufacturer.

3.4 IDENTIFICATION

- .1 Identify all cables.
- .2 Identify each conductor with wire numbers using a machine printed heat shrink wire marker, similar to PANDUIT LS4H or equivalent.

3.5 FIBER OPTIC SYSTEM INSTALLATION

- .1 Supply, install and test a complete fiber optic system as per Specification and Drawings.
- .2 Terminate fiber optic cables on fiber optic patch panels and at both ends with appropriate end connectors and fiber optic patch panels, unless otherwise specified. All fibres shall be terminated in the patch panels.
- .3 Fiber cable connectors to be SC type connectors.
- .4 Fiber optic cabling between communications rooms to be installed as individual links. No splices or intermediate connections points are allowed. Follow manufacture guidelines and recommendations when installing fiber optical cables.
- .5 Label all fiber optical cables with a high quality material and adhesive type label.

- .6 Ground and testing of communications equipment to be done in accordance with industry standards testing guidelines, and as per local electrical safety code.

3.6 FIBER OPTIC SYSTEM TESTING

- .1 Test all fiber optic cables for attenuation and length.
- .2 Testing shall be in accordance with ANSI/TIA/EIA-526-7. ANSI/TIA/EIA-568-B, ANSI/TIA/EIA-455 for Single-mode 9/125µm.
- .3 Test cable for continuity to include cable, connectors, splices (if applicable) and adapters on each strand.
- .4 Cable links must be tested 100% of the installed cable. Any failing links must be diagnosed and corrected, followed with a new test to verify that the corrected link meets the manufacturer and standards performance requirements.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling or reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by communications equipment installation.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute, Latest Editions
 - .1 ANSI J-STD-607-A, Joint Standard - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
- .2 Telecommunications Industries Association (TIA)/Electronic Industries Alliance (EIA), Latest Editions
 - .1 TIA/EIA-606, Administration Standard for the Commercial Telecommunications Infrastructure.
- .3 U.S. Department of Labor/Occupational Safety and Health Administration (OSHA), Latest Editions
 - .1 Nationally Recognized Testing Laboratory (NRTL).

1.2 SYSTEM DESCRIPTION

- .1 Telecommunications grounding and bonding system consist of grounding busbars, bonding backbones, and other bonding conductors.
- .2 Provides ground reference for telecommunications systems within building and bonding to it of telecommunications rooms.
- .3 Metallic pathways, cable shields, conductors, and hardware within telecommunications spaces are bonded to telecommunications grounding and bonding system.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal: Separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)

- .1 Predrilled copper busbar, listed by NRTL, electrotin plated with holes 8 mm diameter for use with standard-sized lugs to: ANSI J-STD-607-A
- .2 Dimensions 6 mm thick, 100 mm wide, ANSI J-STD-607-A

2.2 TELECOMMUNICATIONS GROUNDING BUSBAR (TGB)

- .1 Predrilled copper busbar, listed by NRTL, electrotin plated with holes 8 mm diameter for use with standard-sized lugs to: ANSI J-STD-607-A
- .2 Dimensions 6 mm thick, 50 mm wide, ANSI J-STD-607-A

2.3 BONDING CONDUCTOR FOR TELECOMMUNICATIONS

- .1 3/0 AWG copper conductor, green insulated to: ANSI J-STD-607-A

2.4 TELECOMMUNICATIONS BONDING BACKBONE (TBB)

- .1 3/0 AWG copper conductor, green insulated to: ANSI J-STD-607-A

2.5 WARNING LABELS

- .1 Non-metallic warning labels in English and French to: ANSI J-STD-607-A.
- .2 Identify labels with wording "If this connector is loose or must be removed, please call the building telecommunications manager".

Part 3 Execution

3.1 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)

- .1 Install TMGB on insulated supports 50 mm high at location as indicated.

3.2 TELECOMMUNICATIONS GROUNDING BUSBAR (TGB)

- .1 Install TGB in main terminal/equipment room and each telecommunications room.

3.3 BONDING CONDUCTORS GENERAL

- .1 When placed in ferrous metallic conduit or EMT longer than 1 m, bond to each end of conduit or EMT using grounding bushing, use 6 AWG copper conductor.

3.4 BONDING CONDUCTOR FOR TELECOMMUNICATIONS

- .1 Install bonding conductor for telecommunications from TMGB to service equipment (power) ground.
- .2 Use exothermic welding, approved 2 hole compression lugs for connection to TMGB.

3.5 TELECOMMUNICATIONS BONDING BACKBONE (TBB)

- .1 Install TBBs from TMGB to each TGB as indicated.
- .2 Use exothermic welding, approved 2 hole compression lugs for connection to TMGB and TGBs.

3.6 BONDING TO TMGB

- .1 Bond metallic raceways in telecommunications entrance room to TMGB using 3/0 AWG copper conductor, green insulated.
- .2 For cables within telecommunications entrance room having shield or metallic member, bond shield or metallic member to TMGB using 3/0 AWG copper conductor, green insulated.
- .3 Bond equipment cabinet and rack located in to TMGB using 3/0 AWG copper conductor, green insulated.

3.7 BONDING TO TGB

- .1 Bond metallic raceways in to TGB using 3/0 AWG copper conductor, green insulated.

- .2 For cables having shield or metallic member, bond shield or metallic member to TGB using 3/0 AWG copper conductor, green insulated.
- .3 Bond equipment cabinet and rack to TGB using 3/0 AWG copper conductor, green insulated.

3.8 LABELLING

- .1 Apply warning labels to telecommunications bonding and grounding conductors.
- .2 Apply additional administrative labels to: TIA/EIA-606.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Section 27 05 13.

Part 2 PRODUCTS

2.1 GENERAL

- .1 Provide exterior finishes on all enclosures in ANSI 61 Grey. Interior shall be finished in white.
- .2 The enclosures to be suitable for carrying the weight of the equipment mounted inside the panel and on the doors without any warping, sagging, or distortion.

2.2 ENCLOSURES

- .1 Provide NEMA 1 gasketed enclosures in MCC rooms and control rooms.
- .2 Provide NEMA 4 enclosures for non-corrosive process areas and include hazardous area approvals for classified areas.
- .3 Provide NEMA 4X enclosures for outdoor, wet, and corrosive process areas and include hazardous area approvals for classified areas.
- .4 Provide NEMA 7/3R enclosures for equipment in classified areas.
- .5 Enclosures for mounting field control indicator lamps and switches in unclassified areas to be NEMA 4X enclosures.
- .6 Enclosures for mounting field control indicator lamps and switches in Class 1 areas to be NEMA 7/3R enclosures.

2.3 PANEL ENCLOSURES

- .1 Fabricate panel enclosures from 11 gauge steel panels complete with necessary stiffening to form a rigid free-standing line-up. The structures must be suitable for carrying the weight of the equipment mounted inside the panel and on the doors. Provide back mounting plate or equivalent, removable top and bottom cable entry plates.
 - .1 Provide panels with front access only. Doors to be key lockable and fitted with 3-point heavy duty latching assemblies. Provide a continuous piano style hinge and a pneumatic hold open device on each door.
- .2 Provide a switched fluorescent light fixture and 120 VAC duplex convenience receptacles inside the enclosure.

2.4 MARSHALLING AND CONTROL PANELS

- .1 Supply, fabricate, check out, document, and deliver to site fully equipped and functional panels.
- .2 Supply all components contained on or within the panels fully wired.

- .3 Provide all accessories, materials and methods for fabrication not covered by this Specification, but which are necessary to complete the fabrication of the control panels.

2.5 WIRING AND ACCESSORIES

- .1 Provide wiring inside the panels according to the following specifications:
 - .1 Control wiring to be a minimum of #16 AWG tinned stranded copper; insulation rated at 600 V.
 - .2 Wiring for power distribution shall be a minimum of #14 AWG tinned stranded copper; insulation rated at 600 V.
 - .3 Refer to Division 26 for cable routing requirements.
- .2 Tag each wire at both ends with machine printed heat shrink sleeves.
- .3 Wiring systems with different voltage levels or types shall be suitably segregated within the panel, as per the CEC.
- .4 Run all wiring in enclosed plastic ducts such as Panduit or approved equivalent. Size all ducts so that the total cross sectional area of the insulated wire and cable does not exceed 40% of the cross sectional area of the duct.
- .5 Provide a minimum clearance of 40 mm between ducts and any point of wire termination.
- .6 Terminate all wiring, incoming and outgoing, at terminal strips mounted inside the panels. Identify each terminal strip with a terminal strip number (1, 2, N, G), appended to it. Wires to be identified as follows:
 - .1 Wire identification to use the connected field device tag name with the wire's associated terminal number appended to it (e.g. LSH-3021-5).
 - .2 Identify every joint and/or terminal of the above wire run with the same identifier until the wire meets another tagged device, at which point the wire identifier will change to use the new device name and terminal number.
 - .3 Identify spare wires by using the destination identifier, i.e. the location and terminal identifier of the opposite end of the wire are combined to form the wire tag.
- .7 Provide a 120 VAC power distribution system and DC power distribution systems in each panel as required for installed equipment. Provide a thermal magnetic circuit breaker on each main power circuit and a fused terminal block for each branched circuit off the main.
- .8 Provide fused disconnect type terminal blocks Weidmuller or equivalent to isolate field wiring that is powered from the panel.
- .9 Provide sufficient terminals so that not more than 2 wires are connected under the same terminal. Provide 20% spare terminal capacity at each terminal block assembly.
- .10 Terminals to be Weidmuller or equivalent, colour coded to be consistent with existing.

Provide nameplates for each device on or within the panels and enclosures. Nameplates to be white lamacoid with black lettering with a minimum size of 25 mm x 75 mm with up to three lines of 3 mm lettering. Securely fasten nameplates in and situate them in a visible location.

2.6 PANEL GROUNDING

- .1 Provide a ground system for the instrumentation circuits, isolated from the main power system ground to each marshalling panel.
- .2 Provide grounding lugs for each panel, suitable for termination of up to #2 AWG copper grounding conductor.
- .3 Provide in each marshalling panel an isolated copper grounding busbar 6 x 25 x 600 mm, equipped with necessary lugs for accepting two #2 AWG grounding conductors.
- .4 Firmly bond all panel mounted devices on or within the panels to ground. Provide supplementary bonding conductors for back panels and doors. Attach a separate bonding conductor to all devices that are not firmly fastened to the panels with screws for such devices as case mounted instruments, meters, etc.

Part 3 EXECUTION

3.1 MOUNTING HEIGHTS

- .1 Unless otherwise specified or a conflict exists, mount all panels, starters and disconnects 2000 mm to top of cover.

END OF SECTION