1. GENERAL

1.01 SECTION INCLUDES

.1 Building wire and cable.

.1 Armoured cable.

.2 Metal clad cable.

.3 Fire resistive cables.

.4 Wiring connectors and connections.

.2 Permitted voltage drop for feeder and branch circuits.

1.02 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 0.3-09 (R2019), Test methods for electrical wires and cables.

.4 CSA C22.2 No. 48-15, Nonmetallic sheathed cable.

.5 CSA C22.2 No. 51-14, Armoured cables.

.6 CSA C22.2 No. 52-15, Underground secondary and service-entrance cables.

.7 CSA C22.2 No. 65-13, Wire connectors.

.8 CSA C22.2 No. 75-17, Thermoplastic insulated wires and cables.

.9 CSA C22.2 No. 123-16, Aluminum sheathed cables.

.10 CSA C22.2 No. 131-14, Type TECK 90 cable.

.2 NECA (National Electrical Contractors Association) - Standard of Installation.

.3 NETA (International Electrical Testing Association) - ATS-2021 - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

.4 CAN/ULC-S139:2017 – Standard Method of Fire Test for Evaluation of Integrity of Electrical Power, Data and Optical Fibre Cables.

1.03 COORDINATION

.1 Where wire and cable destination is indicated, and routing is not shown, determine exact routing and lengths required.

1.04 CLOSEOUT SUBMITTALS

.1 Record Documents: Indicate as-constructed feeder sizes on single line diagram.

.2 Megger test results.

.3 Fire rated cables: manufacturer's certification that the cables have been installed in accordance with the manufacturer's instructions.

1.05 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

2. PRODUCTS

2.01 MANUFACTURERS

.1 American Wire Group.

.2 General Cable.

.3 Nexans.

.4 Prysmian.

.5 Southwire.

2.02 REGULATORY REQUIREMENTS

.1 Provide products listed and classified by CSA Group as suitable for the purpose specified and indicated.

2.03 CONDUCTOR MATERIAL

.1 Submit bid based on copper conductors only.

.2 Aluminum: Not permitted.

2.04 BUILDING WIRE

.1 RW90:

.1 Single copper conductor.

.2 Minimum 12 AWG for branch circuit wiring.

.3 Minimum 14 AWG for 120 V control wiring.

.4 Chemically cross-linked polyethylene insulation.

.5 Rated for 90°C, 600 V.

.6 Suitable for handling to minus 40°C.

.7 For interior installations in conduit.

.2 RWU90:

.1 Single copper conductor.

.2 Minimum 12 AWG for branch circuit wiring.

.3 Minimum 14 AWG for 120 V control wiring.

.4 Chemically cross-linked polyethylene insulation.

.5 Rated for 90°C, 1000 V.

.6 Suitable for handling to -40°C.

.7 For exterior installations in conduit.

.3 T90 Nylon:

.1 Single copper conductor.

.2 Thin wall PVC insulation with nylon covering.

.3 Rated for 90°C, 600 V.

.4 May be used up to size 10 AWG for interior installations.

.5 Base conduit fill on RW90 cable diameters.

2.05 ARMOURED CABLE

.1 General

.1 Connectors: standard as required, complete with anti-short rings.

.2 Runs to be limited to fixture drops, and runs to devices in walls and partitions, maximum horizontal runs in exposed areas and ceiling spaces to be 1.8 m (6 ft).

.3 Do not daisy chain (leap frog) luminaires with armoured cable.

.2 Type AC:

.1 Two, three or four copper conductors rated RW90, 1000 V.

.2 Bare copper ground wire.

.3 Insulation Voltage Rating: 600 V.

.4 Insulation Temperature Rating: 90°C (194°F).

.5 Insulation Material: Thermoplastic.

.6 Overall interlocked aluminum tape armour.

.3 Type SPC90:

.1 Use for LED lighting, fluorescent dimming controls, and other SMART building applications.

.2 Colour coded cable with power, control, and signal under one cable.

.3 12-2C Power with a 16-2C Control.

.4 Bare copper ground wire.

.5 Insulation Voltage Rating: 600 V.

.6 Insulation Temperature Rating: 90°C (194°F).

.7 Insulation Material: Thermoplastic.

2.06 FIRE RESISTIVE CABLES

.1 General:

.1 2 hour fire rating to CAN/ULC-S139 and to meet 2012 Ontario Building Code rule 3.2.7.10.

.2 Alternative means of compliance:

.1 Conduits encased in a minimum of 50 mm (2 in) of concrete.

.2 Be protected by a fire rated assembly listed to achieve the minimum fire rating as indicated.

.2 Manufacturers:

.1 nVent Pyrotenax 1850 series Mineral Insulated (MI) cable.

.2 VITALink MC Brand Type MC-RC90, manufactured by Marmon Wire & Cable Inc. (listed by ULC under ULC category code 'FHIT7' or 'FHJR7', dated 19 May 2015). This cable is not to be installed in conduit.

.1 Request quotation from manufacturer or manufacturer's representative for field certification of installed Vitalink cables prior to requesting Consultant's construction field review.

.2 Power cable must be installed according to UL protocol FHIT7.120 – Electrical circuit integrity systems certified in Canada.

.3 Prysmian Lifeline RC90 cable.

.1 Installation in accordance with UL protocol FHIT7-51, and FHIT7-51A.

.2 System makes use of Remke connectors and Resolve boxes, with no substitutions.

.3 Substitution Limitations:

.1 Substitutions may only be considered by the Consultant if the product is listed by ULC under ULC Category Codes 'FHIT7' or 'FHJR7'.

2.07 TECK90 CABLE

.1 Single, three, or four conductors as indicated on drawings.

.2 Cable to CSA C22.2 No. 131.

.3 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.4 Insulation: Cross-linked polyethylene (XLPE), type RW90, rating: 600 V.

.5 Inner jacket: polyvinyl chloride.

.6 Armour: interlocking aluminum.

.7 Overall covering: thermoplastic.

.8 Fastenings:

.1 One-hole steel straps to secure surface cables 50 mm diameter and smaller. Two-hole steel straps for cables larger than 50 mm diameter.

.2 Channel type supports for two or more cables at 1500 mm centres.

.3 Threaded rods: 6 mm diameter to support suspended channels.

.9 Connectors: Watertight, approved for TECK cable.

2.08 CONDUCTOR PULLING LUBRICANT

.1 Where pulling lubricant is required, use non-wax based cable lubricants compatible with cable manufacturer recommendations, such as American Polywater.

2.09 CONNECTORS

.1 Armoured cable connectors must be proper squeeze type connectors and plastic anti-short bushings at terminations.

.2 Connectors for conductors connecting to devices as per local governing electrical requirements to be equal to IDI Electric (Canada) Ltd., "Ideal" No. 451, No. 452, and No. 453, "Wing-Nut", CSA certified, 600 V, rated pressure type connectors.

.3 For conductors sized 3/0 AWG and greater, provide long barrel double crimp, two (2) hole compression type lug connectors, unless otherwise noted.

2.10 WIRING TERMINATION

.1 Lugs, terminals, or screws used for termination of wiring to be suitable for copper conductors. Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring. Maintain phase sequence and colour coding throughout.

.2 Splice wire, up to and including 6 AWG, with nylon insulated expandable spring type connectors.

.1 Thomas & Betts – Marr Max series.

.3 Splice large conductors using compression type connections insulated with heat shrink sleeves.

.1 Thomas & Betts – 5400 Series lugs & heat shrink type #s series.

3. EXECUTION

3.01 EXAMINATION

.1 Verify that field measurements are as indicated.

.2 Wire and cable routing indicated is approximate unless dimensioned.

.3 Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

.4 Voltage Drop

.1 Ensure voltage drop in power and control conductors is in accordance with the requirements of the OESC.

.2 Size conductors accordingly when sizes are not identified.

.1 Feeder conductors: maximum voltage drop of 2%.

.2 Branch circuit conductors: maximum voltage drop of 3%.

.5 Verify that mechanical work likely to damage wire and cable has been completed.

.6 Verify that raceway installation is complete and supported.

3.02 PREPARATION

.1 Completely and thoroughly swab raceway before installing wire.

3.03 INSTALLATION

.1 Route wire and cable as required to meet project conditions.

.2 Install cable to CSA C22.1 and per manufacturer's installation guidelines.

.3 Conduit and cable supports:

.1 All wiring to be installed in EMT at all exposed areas unless otherwise specified.

.2 All mechanical equipment to be connected with liquid tight flexible conduit.

.3 Support cables above accessible ceiling, using spring metal clips to support cables from structure. Do not rest cable on ceiling panels.

.4 Conductors

.1 Provide separate neutral for each circuit. Common neutrals not permitted.

.2 Use solid conductor for feeders and branch circuits 10 AWG and smaller.

.3 Use stranded conductors for control circuits.

.4 Use conductor not smaller than 12 AWG for power and lighting circuits.

.5 Use conductor not smaller than 16 AWG for control circuits.

.6 Use 10 AWG conductors for 20 A, 120 V branch circuits longer than 25 m.

.5 Pulling conductors

.1 Pull all conductors into raceway at same time.

.2 Use suitable wire pulling lubricant for building wire 4 AWG and larger.

.3 Neatly train and lace wiring inside boxes, equipment, and panelboards.

.4 Protect exposed cable from damage.

.6 Connectors

.1 Use suitable cable fittings and connectors.

.2 Clean conductor surfaces before installing lugs and connectors.

.3 Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

.4 Use split bolt connectors for copper conductor splices and taps 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 per cent of insulation rating of conductor.

.5 Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

.6 Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

.7 Identification

.1 Identify and colour code wire and cable to Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

.2 Where colour-coded tape is utilized, apply a minimum of 50 mm (2 in) at terminations, junction and pull boxes and conduit fittings. Do not paint conductors under any condition.

.3 Utilize colour coding on bussing in panels and, switchgear, disconnects, and metering cabinets to match conductor colour coding.

3.04 CONDUCTORS, WIRES, AND CABLES

.1 Provide fire rated conductors or provide a fire rated assembly around conductors used for life safety applications as described in 2012 OBC 3.2.7.10.

.2 Indoor wiring installed in conduit, unless otherwise noted: 600 V "RW90 XLPE".

.3 Wiring in channel back of fluorescent and LED lighting fixtures: 600 V type GTF or TEW.

.4 Lighting and power branch circuit wiring:

.1 Copper, minimum 12 AWG.

.2 Home runs to lighting and receptacle panels, which exceed 22 m (75 ft) in length: minimum 10 AWG.

.5 Size wires for 2 per cent maximum voltage drop to farthest outlet on a maximum 80% loaded circuit.

.6 Outdoor wiring: “RWU90 XLPE”.

.7 Conductors shall be colour coded. Conductors 10 AWG and smaller shall have colour impregnated into insulation at time of manufacture. Conductors size 8 AWG and larger may be colour coded with adhesive colour coding tape, but only black insulated conductors shall be employed in this case, except for neutrals which shall be white wherever possible.

.8 Colour coding as follows:

.1 Phase "A" – Red.

.2 Phase "B" – Black.

.3 Phase "C" – Blue.

.4 Control – Orange.

.5 Ground – Green.

.6 Neutral – White.

.9 Neatly train circuit wiring in cabinets, panels, pull boxes and junction boxes and hold with nylon cable ties.

3.05 SITE TESTS AND INSPECTIONS

.1 Perform continuity tests of all feeders, motor circuits, and branch circuits.

.2 Perform insulation-resistance test (megger test) on each feeder. Submit report to the Consultant.

End of Section