

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 271120 – Terminals and Connectors for Communication Conductors.

1.2 REFERENCES

- .1 The following references and standards shall be followed with respect to the cabling system supply, installation and testing, but shall not alter the design of the cabling system as detailed on the drawings and specifications.
- .2 CAN/CSA-T530-M90 Building Facilities, Design Guidelines for Telecommunications.
- .3 CAN/CSA-T529-M Design Guidelines for Telecommunications Wiring System in Commercial Buildings.
- .4 CAN/CSA-C22.2 No. 214-08 Communications Cables.
- .5 CAN/CSA-C22.2 No. 182.4-M90(R2006) Plugs, Receptacles and Connectors for Communication Systems.
- .6 EIA/TIA Bulletin TSB-36 Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted Pair Cables, Electronic Industries Association (USA), November 1991.
- .7 Uniform International Conference of Building Officials Building Code (ICBO).
- .8 EIA/TIA-569- A Commercial Building Standard for Telecommunication Pathways and Spaces, latest draft.
EIA/TIA-568-B2 (2001) Commercial Building Wiring Standard, latest draft.
EIA/TIA-607 (CSA T527) Grounding and Bonding
EIA/TIA-606 (CSA T528) Administration Standards
EIA/TIA TSB-67 UTP End-to-End System Testing
- .9 BICSI Telecommunications Distribution Method Manual 10th Edition.
- .10 BICSI Information Transport System Manual 4th Edition.
- .11 CAN/ULC C102.4M (1987) Test for Fire and Smoke Characteristics of Electrical Wiring and Cable.
- .12 Treasury Board Information Technology Standard (TBITS) No. 6.9 Profile for the Telecommunications Wiring System in Government Owned and Leased Buildings.
- .13 CAN/CSA C22.2 No. 232-M Optical Fibre Cables.
- .14 ANSI/TIA/EIA-492AAAB (1998) Detailed Specification for 50µm Core Diameter/125mm Cladding Diameter Class 1A Multimode, Graded-Index Multimode Optical Waveguide Fibres.
- .15 ANSI/TIA/EIA-492BAAA Detailed Specification for Class Iva Dispersion-Unshifted Singlemode Optical Waveguide Fibres Used in Communication Systems.

- .16 ANSI/TIA/EIA-455-61, FOTP-61 Measurement of Fibre or Cable Attenuation.
- .17 ANSI/TIA/EIA-526-14A, OFSTP14A (1998) Optical Power Loss Measurement of Installed Multimode Fibre Cable Plant.
- .18 ANSI/TIA/EIA-604-3, FOCIS 3 Fibre Optic Connector Intermateability Standard.
- .19 ANSI/ICEA S-83-596 Fibre Optic Premises Distribution Cable.
- .20 ANSI A136.2 American Standard for the Safe Operation of Optical Fibre Communications Systems Utilized Laser Diode and LED Sources.

1.3 SYSTEM DESCRIPTION

- .1 Structured system of telecommunications cables (copper and optical fibre) installed within buildings for distributing voice and data (including video) signals. Cabling shall be a twenty-five (25) year Belden certified system.

Part 2 Products

2.1 HORIZONTAL CABLING, DATA

- .1 Cable supplied to all data outlets shall be Category 6A, UTP- 4 Pair, 24 AWG, CMR rated cable, FT4 rated.
- .2 Category 6A Electrical Specifications
 - .1 DC Resistance @ 20C, Maximum: 9.38 W/100meters
 - .2 DC Resistance Unbalance, Maximum: 3%
 - .3 Mutual Capacitance, Maximum: 5.6 nF/100meters
 - .4 Capacitance Unbalance Pair to Ground, Maximum: 330pF/100meters
 - .5 Input Impedance: 100+/- 12 Ohms from 1 Hz to 100MHz 100+/- 15 Ohms from 100MHz to 350MHz
 - .6 Nominal Velocity of Propagation: NVP Plenum 70% @ 10MHz
 - .7 Propagation Delay (Skew) , Maximum: 25 ns/100meter

- .8 Yellow in color.

Maximum Attenuation Values, Worst Pair and Cross Talk (NEXT Min).

Frequency (MHz)	Attenuation (dB/100m)	Next (dB Min.)
1	2	78.3
4	3.7	69.3
8	5.2	64.8
10	5.9	63.3
16	7.4	60.2
20	8.3	58.8
25	9.3	57.3
31.25	10.4	55.9
62.5	14.9	51.4
100	19	48.3
200	27.5	43.8
250	31	42.3
300	34.2	41.1
350	37.2	40.1
400	40	39.3

2.2 HORIZONTAL CABLING, VOICE

- .1 Cable supplied to all voice outlets shall be Category 5A, UTP-4 Pair, 24 AWG, CMR rated cable, FT4 rated.
- .2 Category 6A Electrical Specifications
 - .1 DC Resistance @ 20C, Maximum: 9.38 W/100meters
 - .2 DC Resistance Unbalance, Maximum: 3%
 - .3 Mutual Capacitance, Maximum: 5.6 nF/100meters
 - .4 Capacitance Unbalance Pair to Ground, Maximum: 330pF/100meters
 - .5 Input Impedance: 100+/- 12 Ohms from 1 Hz to 100MHz 100+/- 15 Ohms from 100MHz to 350MHz
 - .6 Nominal Velocity of Propagation: NVP Plenum 70% @ 10MHz
 - .7 Propagation Delay (Skew) , Maximum: 25 ns/100meter

- .3 Blue in color.

Maximum Attenuation Values, Worst Pair and Cross Talk (next min).

Frequency (MHz)	Attenuation (dB/100m)	Next (dB Min.)
1	2	78.3
4	3.7	69.3
8	5.2	64.8
10	5.9	63.3
16	7.4	60.2
20	8.3	58.8
25	9.3	57.3
31.25	10.4	55.9
62.5	14.9	51.4
100	19	48.3
200	27.5	43.8
250	31	42.3
300	34.2	41.1
350	37.2	40.1
400	40	39.3

2.3 VOICE RISER CABLES

- .1 Multi-pair 100 ohm UTP cable.
- .2 Conductors Category 3, #24 AWG solid copper, thermoplastic insulated, formed into binder groups of 25 pairs and enclosed in an overall thermoplastic jacket.
- .3 Cable shall meet requirements of CAN/CSA-T529-M91, Clause 10.3 for backbone wiring cable.

2.4 FIBRE OPTIC RISER CABLE, INDOOR

- .1 Type OFNR/OFNP, indoor rated, FT4.
- .2 Cable consists of 24 fibres and 12 fibres per tube.
- .3 Single mode fibres: 9/125µm fibres.
- .4 Maximum attenuation: 3.25dB @ 850nm and 1.0dB @ 1300nm.
- .5 Minimum laser bandwidth: 500MHz/km @ 850nm and 500MHz/km @ 1300nm.
- .6 Crush Resistance: 2000N/cm per EIA-455-41
- .7 Impact Resistance: 2000 Impacts w/1.6 N-m per EIA-455-25

- .8 Flexure: 2000 cycles minimum per EIA-455-104
- .9 Min. Bend Radius: 10x Cable diameter, Long term no load
- .10 Min. Bend Radius: 15x Cable diameter, Short term load

2.5 FIBRE OPTIC HORIZONTAL DISTRIBUTION CABLE, INDOOR

- .1 Type OFNR/OFNP, indoor rated, FT-4.
- .2 Cable consists of two (2) single mode fibres.
- .3 Single mode fibres: 62.5µm fibre.
- .4 Maximum attenuation: 1.0dB @ 1300nm.
- .5 Minimum laser bandwidth: 500MHz/km @ 1300nm.
- .6 Crush Resistance: 500N/cm per EIA-455-41
- .7 Impact Resistance: 200 Impacts w/1.6 N-m per EIA-455-25
- .8 Flexure: 2000 cycles minimum per EIA-455-104
- .9 Min. Bend Radius: 10x Cable diameter, Long term no load
- .10 Min. Bend Radius: 15x Cable diameter, Short term load

2.6 COAXIAL CABLE (CXC)

- .1 Single coaxial member, 75ohm impedance each having metallic centre conductor surrounded by dielectric material and 2 metal outer conductors separated by dielectric material and surrounded by PVC jacket: to CAN/CSA C22.2 No.214 FT-4 fire rated jacket.
- .2 Distribution cable (RG-11), 75ohm impedance. Centre conductor No. 14 AWG, copper-covered steel, insulation of cellular polyethylene, shield of aluminum foil plus braid, shield coverage 97%. Loss at 500 MHz not to exceed 3.5 dB per 30m.
- .3 Drop cable (RG-6), 75ohm impedance. Centre conductor No. 18 AWG, copper-covered steel, insulation of cellular polyethylene, shield of aluminum foil plus braid, shield coverage 97%. Loss at 500 MHz not to exceed 5 dB per 30m.

2.7 SPEAKER CABLE

- .1 Colour coded, shielded, twisted pair #18 tinned copper conductor. Cabling shall be rated for plenum rated installation.

Part 3 Execution

3.1 INSTALLATION OF HORIZONTAL DISTRIBUTION CABLES

- .1 Install horizontal cables, as indicated on drawings from termination in telecommunications closet to outlets.
- .2 For distribution of television signals, terminate CXC cable on type F connectors.
- .3 Terminate OFC cables with SC connectors.
- .4 Use cables, as indicated in telecommunications closet or equipment room.
- .5 No splices are permitted in any communications cabling.
- .6 No single cable shall exceed 90 meters (295ft) in length, measured from the patch panels in the communication room to each RJ45 jack located in the work area.
- .7 In locations where the cabling is not in conduit, it will be installed in the same manner as conduit systems i.e. straight lines, parallel to wall etc. The cables will be bundled together with hook and loop straps every 610 mm.
- .8 Plastic tie-raps, "c" clamps and "D" rings are not permitted for use with communications cabling.
- .9 Each horizontal data (all renovation areas) and main floor voice cable must be terminated with modular female Cat 6A RJ45 components at both ends.
- .10 Each horizontal voice cable on the second floor must be terminated with modular female Cat 6A RJ45 components at the workstation end only. Termination in telecommunications rooms shall be completed on new IDC/IDC connectors as per detail on drawings.
- .11 The connectors at the patch panel and at the outlet must be from the same manufacturer and be the same model.
- .12 The connectors at the workstation end will be installed in flush mount boxes, wall plates or modular furniture plates as required.
- .13 The contractor must submit shop drawings detailing the material and installation approach to be used at workstation locations with the facilities project manager prior to installation. Local IT must approve the final workstation configuration.
- .14 Surface mount boxes must not be installed with the jack in the upward position.
- .15 The outlet components must be configured to modular jack pair-assignment T568-A.
- .16 Cable twists must be maintained up to the connection points at both ends of the cable.
- .17 A maximum of 12.7mm of the cable jacket, measured from the end of the connector may be removed.

- .18 Cable bend radius shall not be less than the minimum radius specified by the manufacturer for the particular cable in use and shall be made without strain or stress to the cable. Typically, the cable-bending radius shall not be less than eight times the cable diameter.
- .19 All data and voice communications cables will remain:
 - .1 30.5 cm (12 inches) from power lines carrying 5 KVA or less
 - .2 91.5 cm (36 inches) from power lines carrying more than 5 KVA
 - .3 30.5 (12 inches) from fluorescent lights

3.2 WORKSTATION OUTLET INSTALLATION

- .1 Each cable type shall be terminated as indicated below:
 - .1 Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-B.2 document, manufacturers' recommendations and/or best industry practices.
 - .2 Pair untwist at the termination shall not exceed one-half an inch for Category 6A connecting hardware.
 - .3 Bend radius of the cable in the termination area shall not be less than 4 times the outside diameter of the cable.
 - .4 The cable jacket shall be maintained as close as possible to the termination point.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.
 - .1 The departmental representative shall be notified one week prior to any testing so that the testing may be witnessed.
 - .2 Before requesting a final inspection, the Contractor shall perform a series of end to end installation performance tests of all cabling. The Contractor shall submit for approval a proposal describing the test procedures, test result forms, and timetable for all copper plant wiring.
 - .3 When errors are found, the source of each error shall be determined, corrected, and the cable re-tested. All defective components shall be replaced and re-tested. Defective components not corrected shall be reported to the Engineer with explanations of the corrective actions attempted.
 - .4 Test results for each UTP cable must be submitted with identification to match labels on all patch panel ports and 8 position modular jacks, and identification to match as-built associated with that cable.
 - .5 The departmental representative will observe and verify the accuracy of test results submitted.
- .2 UTP cable installations tests:

- .1 Contractor to show evidence of channel bandwidth performance by submitting to the Engineer "Testing Certificate" of manufacturer's product evaluated by independent testing authority or agency to TIA/EIA-568-B.2-1.
- .2 The installed channel must pass all Category 6A tests using a high performance level tester equipped with a compatible link interface adapter. Testing capability shall be up to 350 MHz including verification for Cable length, Wire Mapping, Cross-Talk (NEXT), Equal Level Far-End Cross-Talk (ELFEXT), Power Sum Cross-Talk (PSNEXT), Power Sum Equal Level Far-End Cross-Talk (PSELFEXT), Attenuation, Attenuation to Cross-Talk Ratio (ACR), Propagation Delay, Return Loss, and Delay Skew.
- .3 For each network drop installed the following documentation must be provided on a CD:
 1. Room # of installation
 2. Cable ID
 3. Length of cable in metres
 4. Wall plate ID
 5. An indication of what test type was used and whether the test was a PASS or FAIL.
 6. Output from cable tester showing attenuation on each pair, and NEXT for all pair combinations. Complete output of the test result is desirable.

The test results from the cable tester should also be included in electronic form on a compact disk in PDF format.

- .3 Provide as-built drawings of all communications outlet locations and labeling at each workstation.

3.4 LABELING

- .1 Label each cable within 50mm of terminations.
- .2 Use permanent, wrap around, self-adhesive labels employing individual characters. Characters shall be minimum 14 point, bold, Arial font, black on white background.
- .3 Prior to labelling, coordinate with the departmental representative to determine the exact labelling standard. Allow for 10 characters per label.

END OF SECTION

Part 1 General

1.1 SYSTEM DESCRIPTION

- .1 Termination, patch cords, and cross-connection equipment installed inside building for voice and data for telecommunications systems employing unshielded-twisted-pair (UTP), shielded-twisted-pair (STP), coaxial (CXC), and optical fibre (OFC) cables.

1.2 RELATED SECTIONS

- .1 Section 06 10 11 - Rough Carpentry
- .2 Section 27 05 14 – Communications Cables Inside Building
- .3 Section 26 05 01 – Common Work Results – Electrical
- .4 Section 01 74 19 – Construction / Demolition Waste Management and Disposal

1.3 REFERENCES

- .1 CAN/CSAT530-M90, Building Facilities, Design Guidelines for Telecommunications.
- .2 CAN/CSAC22.2No.182.4-M90(R2006), Plugs, Receptacles and Connectors for Communication Systems.
- .3 CAN/CSAT529-91, Design Guidelines for Telecommunications Wiring Systems in Commercial Buildings.
- .4 Canadian Open Systems Application Criteria (COSAC) Profile for the Telecommunications Wiring System in Government Owned and Leased Buildings, Treasury Board Information Technology Standards TBITS-6.9
- .5 EIA/TIA Bulletin TSB-36, Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted Pair Cables, Electronic Industries Association (USA), November 1991.
- .6 TIA/EIA Telecommunications Systems Bulletin TSB40, Additional Transmission Specifications for Unshielded Twisted-Pair Connecting Hardware, Telecommunications Industry Association, August 1992.

Part 2 Products

2.1 PATCH PANELS

- .1 One piece, unloaded, black, painted steel suitable for mounting in a standard 475mm wall or floor rack assembly.
- .2 Minimum 24 port. Provide quantity of multi-port patch panels to accommodate all terminations plus 25% for future.
- .3 Labelled in sequential numbering from top left to bottom right.

2.2 FLOOR MOUNT RACK

- .1 Free standing open rack assembly complete with two (2) vertical 75mm wide predrilled 12-24 EIA holes extruded aluminum channels, 1 or 2 piece full width predrilled base mounting plate and top channel. Rack shall be self squaring and self supporting.
- .2 Rack shall be constructed of 6061-T6 aluminum complete with black polyurethane powder coat finish.
- .3 Static load capacity – 225kg.
- .4 Suitable for joining multiple racks together.
- .5 Provide two (2) full height 100mm square vertical wiring channels on side of rack complete with 'C' rings on 150mm centres and 100mm access holes for full height.
- .6 Dimensions: 482 (19") wide plus channels, 2134mm (84") height.
- .7 Minimum 44U.
- .8 Provide two (2) 480mm deep shelves for each rack.
- .9 Provide two (2) horizontal aluminum wiring channels on rack complete with arrow shaped fingers on 100mm centres and minimum of six (6) pass through holes on mounting panel. Provide double-hinged spring loaded front cover. Cover to open 180° from left or right or can be removed in entirety.
- .10 Provide all required fastenings, supports and fittings to give a complete factory assembly.

2.3 COVERPLATES

- .1 4 port coverplate.
- .2 Construction and color as per Section 26 27 26 – Wiring Devices.

2.4 DATA OUTLETS

- .1 Flush type, snap-in inserts with encapsulated lead frame design and inline IDC terminating interface.
- .2 Category 6A, RJ-45.
- .3 Suitable for 568A termination.
- .4 Black in color.

2.5 VOICE OUTLETS

- .1 Flush type, snap-in inserts with encapsulated lead frame design and inline IDC terminating interface.
- .2 Category 6A, RJ-45.
- .3 Suitable for 568A termination.
- .4 White in color.

2.6 WALL MOUNT CONNECTORS FOR VOICE

- .1 Fire retardant plastic construction with front and back IDC terminating strips.
- .2 Suitable for terminating 22, 24, or 26 guage plastic insulated solid copper conductors without stripping.
- .3 Connection clips recessed to prevent accidental short circuit contact.
- .4 Contact resistance < 1 Mohm / contact.
- .5 Insulation resistance > 100 Mohm between clips.
- .6 Provide quantity of connectors to accommodate all termination plus 25% future.
- .7 Mount in wall mount connector mount of stamped steel, one piece construction and fire retardant plastic fanning strips. Provide quantity to accommodate all connectors plus 25% future.
- .8 Designation strips shall have fire retardant plastic construction and shall snap onto mounts between connectors. Provide ID labels with designation strips.

2.7 FIBRE OPTIC CABLE TERMINATIONS

- .1 Mechanical Fiber Connector: shall be SC connectors, complete with zirconia ferrule and PC polish for positive mating of optical fibers. Maximum attenuation per mated pair shall be 0.75dB per TIA/EIA0568-A.

SC Connector Specifications:

Insertion Loss:	0.3 dB (typical)
Durability:	<0.2 dB change, 500 cycles
Nominal Fiber O.D.:	125 micron
Storage Temperature:	-40°C to 40°C
Operating Temperature:	0°C to 55°C
Tensile Strength:	54N
Ferrule:	Zirconia
Reflectance:	-30 dB (typical)

July 2013

Page 4 of 4

2.8 FIBER OPTIC CABLE PATCH PANELS

- .1 Rack mountable, fibre express ultra patch panel.
- .2 High density, 1U minimum configuration, to accommodate four (4) frames or cassettes for a maximum of 96 fibres.
- .3 Suitable for duplex SC terminations.
- .4 Hinge mount.
- .5 200mm rear splice tray.
- .6 Black in color.

Part 3 Execution

3.1 INSTALLATION

- .1 Install building communications terminating and cross-connecting systems in rack and on wall in telecommunication closet and equipment room in accordance with manufacturer's instructions.

3.2 INSTALLATION OF COMMUNICATION WIRES

- .1 Colour match conductors on terminal strip in accordance with CAN/CSA C22.2 No.182.4 and CSA T529. For IDC-type connections, use tool with seating and cutting heads for connecting conductors to terminals.
- .2 Harness slack wire in cabinets, terminals and cross-connecting terminating systems.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.

3.4 GROUNDING AND BONDING

- .1 Racks shall be grounded using #6 AWG insulated copper conductor. Provide all required bonding material and hardware and bond to building grounding electrode subsystem at building electrical service entrance. ANSI/TIA/EIA 607 Grounding and Bonding requirements must be met.

3.5 LABELING

- .1 Provide a separate label for each terminated outlet or connector location.
- .2 For outlets at patch panels or workstations, provide self-adhesive labels using black characters on white background.
- .3 Prior to labelling, coordinate with the departmental representative and IT staff to determine the exact labelling requirements. Allow 10 characters per label.

END OF SECTION

PART 1 General

1.1 SYSTEM DESCRIPTION

- .1 Furnish and install all equipment and materials in accordance with these specifications and drawings to provide complete and operating Audio System.
- .2 Remove all existing building paging speakers in the renovation areas during demolition. Provide new building paging system speakers throughout the renovation areas in locations indicated on the plans. Reuse existing paging system cabling located within the renovation areas. Remove all cabling that is not reused in the renovation. All existing system head end equipment is to remain.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section Submittal Procedures.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for audio system for incorporation into manual specified in Section Closeout Submittals.

PART 2 Products

2.1 MATERIALS

- .1 Conduits: to Section 26 05 34 – Conduits, Conduit Fastenings & Conduit Fittings.
- .2 Communication conductors: as indicated, to Section 27 05 14 - Communication Cables Inside Buildings.

2.2 BUILDING WIDE PAGING

- .1 Interior speakers:
 - .1 Wide dispersion type (180°).
 - .2 Frequency response: 70-20K Hz.
 - .3 Selectable 25/70.7V transformer.
 - .4 Recess mount
 - .5 White grille.
 - .6 Similar to TOA F-122 CU.

3.1 INSTALLATION

- .1 Install equipment in accordance with manufacturer's instructions, and as indicated.
- .2 Install new wiring in renovation areas in conduit to location indicated on plans.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01- Common Work Results – Electrical.

END OF SECTION