PART 1 Specification List

DIVISION 27 – COMMUNICATIONS INSTALLATION

END OF SECTION

PART 1 General

1.1 SCOPE OF WORK

.1 The division 27 contractor shall furnish all labour, materials, tools, appliances and equipment to entirely complete and provide for the operation of the electrical systems, as indicated in these specifications, and as shown on drawings.

1.2 WORK INCLUDED IN DIV. 27

.1 The overall intention is to provide for a finished piece of work complete in all aspects, and all items reasonably inferable as called for by the plans and specifications, and by normally accepted good practice, notwithstanding that every item necessarily required may not be particularly mentioned. This contractor shall fulfill his obligation and not take advantage of any unintentional errors or omissions should such exist, to the detriment of the owners' interest. Generally the work includes, but is not limited to the following:

.1 Communication:

.1 Communication demolition as indicated on drawings.

.2 Conduit, wiring and installation;

.3 Testing of systems for acceptance by the inspection authority;

.4 Mark-up "Records Drawings" in red on print and turn over to Consultant.

1.3 WORK NOT INCLUDED IN DIV. 27

.1 Excavation and backfill work shall be the responsibly of the General Contractor.

.2 All architectural finishes, core drilling, cutting, and patching shall be the responsibility of the general contractor.

.3 Any required trenching of floors or removal of existing T-bar ceilings for the running of conduit or cables shall be the responsibility of the General Contractor.

.4 Firestopping of penetrations through walls and floors shall be the responsibility of the general contractor in accordance with Section 27 00 10 – Communication Installations General Requirements.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 This Contractor shall be responsible to coordinate the enclosed applicable sections of these specifications with the following:

- .1 Section 01 10 10 – General Requirements
- .2 Section 01 61 00 – Common Product Requirements
- .3 Section 01 35 29.06 – Health and Safety Requirements.
- .4 Section 01 35 35 – Fire Safety Requirements.
- .5 Section 01 78 00 – Closeout Submittals.
- .6 Section 01 45 00 – Quality Control.
- .7 Section 02 81 01 – Hazardous Materials.
- .8 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .9 Section 01 33 00 – Submittal Procedures.

1.2 GENERAL

.1 This Section covers items common to Sections of Division 27. This section supplements requirements of Division 1 and Division 25.

.2 All wiring and conduit are shown in diagrammatic form only. See architectural drawings for exact location of all walls and openings.

.3 Contractor shall be familiar with building ceiling spaces. Most conduit runs shown as straight runs will consist of several offsets due to service equipment. Contractor may propose alternate paths to achieve similar aims after detailed review of site conditions.

.4 Schedule all electrical work with general contractor and user. The department will remain open during regular hours. All work shall be performed in such a manner as to affect minimal disruption to the occupants. Any disruptive work shall be scheduled during the night or on weekends.

.5 Contractor shall coordinate inspection date with Consultant and shall provide labour for access to all equipment for inspection to confirm work method. Such access shall imply opening of junction/pull boxes.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate, recycle and dispose of waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Collect and separate for disposal: paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with waste management plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility.

.5 Fold-up metal bending, flatten and place in designated area for recycling.

1.4 GUARANTEE

.1 Provide, in supplement of other system guarantee, in writing, a guarantee covering all labor and material for a period of one year from final acceptance of work, and agree to repair and make good all defects during that time.

1.5 CODES AND STANDARDS

.1 Do complete installation in accordance with CSA C22.1, latest revision, except where specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1, latest revision except where specified otherwise.

.3 Abbreviations for electrical terms: to CSA Z85-1983.

.4 Electrical system to conform to latest revision of Model National Energy Code of Canada for Buildings

1.6 CARE, OPERATION AND START-UP

.1 Instruct Consultant and operating personnel in the operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service representative to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.7 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235-83, latest revision.

.2 Equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.8 ADDENDA AND REVISIONS

.1 All addenda, instructions and revisions issued during the tendering period shall become part of the Contract Documents and shall be included in the Tender, and shall take precedence over previous instructions.

.2 The Consultant reserves the right to make revisions to the drawings during the period of construction and these revisions shall take precedence over previously issued drawings.

All revisions to work shall be executed by duly authorized change orders, with the amount of addition or deduction to the contract amount approved by the Owner before the execution of any work entailed in the revisions.

1.9 EXAMINATION OF DRAWINGS AND EXISTING CONDITIONS

.1 The Division 27 Contractor shall become completely familiar with drawings and specifications, as well as construction methods of other trades related to the work, in order to avoid possible conflictions on the project. Should drastic changes be necessary to resolve such conflictions, the Contractor shall notify the Consultant and secure written approval and agreement on necessary adjustments before the installation is started.

.2 Before submitting tender, the Contractor shall visit the site and become familiar with site conditions, availability of storage space and all other factors that might influence the tender. No allowance shall be made for problems arising due to lack of knowledge of existing conditions that could reasonably have been ascertained by a careful inspection.

1.10 DISCREPANCIES

.1 If, during the preparing their tender, Bidders find any errors, omissions, or discrepancies in the plans, specifications or other documents or having any doubt regarding the intent or meaning of any part thereof, shall immediately notify the Consultant, who will send written instructions or clarification to all bidders. Where such discrepancies exist and it is evident that the Contractor could not have properly tendered without clarification, and where such clarification was not requested, no changes to the contract shall be considered in order to have the installation completed correctly. The Owner and Consultant shall not be responsible for oral instructions.

1.11 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate details of construction, dimensions, capacities, and electrical performance characteristics of equipment or material.

.3 Where applicable, include wiring, single line and schematic diagrams.

.4 Include wiring drawings or diagrams showing interconnection with work of other Sections.

.5 Faxes are <u>not</u> acceptable for shop drawings. If sent by fax, they will not be reviewed.

.6 Do not begin fabrication until shop drawings have been reviewed by Consultant. Allow ten (10) working days for Consultant review.

.7 Consultant review of shop drawings does not relieve the contractor of the responsibility for co-ordination of field measurements required to complete the work.

.8 Div. 27 Contractor and General Contractor shall approve all shop drawings by signing and dating them prior to submitting to Consultant. Failure to comply will result in

automatic rejection of shop drawings. When non-compliance results in extra costs due to construction delays, the contractor shall bear these costs.

1.12 SUBMITTALS

.1 All inquiries, shop drawings, requests for substitutions and similar items shall be submitted to the Consultant.

1.13 SUBSTITUTIONS

.1 It is the intent of these specifications to establish the required quality of materials. Where manufacturer's name, catalogue reference, data are used, it is done in order to establish the required quality, style, size or function. The decision as to suitability shall rest with the Consultant.

.2 All materials not meeting the standards as set down by these specifications shall not be allowed on the job site.

.3 Substitutions affecting the design will not be permitted. Additional costs to any other trade or to Consultant as a result of a change or substitution by this Contractor shall be borne by this Contractor.

.4 The listing of a manufacturer as acceptable does not imply acceptance of all products of that manufacturer or only products of that manufacturer. Only products meeting the standards as set out in the specifications will be accepted.

.5 All requests for alternates shall be submitted before award of contract.

.6 Faxes are <u>not</u> acceptable for request for alternates. If sent by fax, they will not be reviewed.

1.14 OPERATION AND MAINTENANCE MANUALS

.1 The Electrical Contractor shall provide three (3) copies of Operation and Maintenance Manuals in accordance with Section 01 78 00- Closeout Submittals. The manuals shall consist of a hard cover three ring binder with removable pages, indexed and tabbed as to content.

.2 Include in Operation and Maintenance Manuals:

- .1 Copy of all approved shop drawings.
- .2 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.
- .3 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature not acceptable.
- .4 Wiring and schematic diagrams and performance curves.
- .5 Name and addresses of electrical contractor.
- .6 Names and addresses of local suppliers.

.7 Copy of all test certificates including:

.1 Insulation / Megger tests,

.8 Copy of all final schedules and existing where modified by this contract.

.9 Copy of signed transmittal verifying all maintenance materials turned over to the owner.

.10 Copy of specifications.

.11 Copy of electrical permit associated with the project.

.12 A letter of guarantee.

1.15 RECORD DRAWINGS

.1 Provide “Record” drawings in accordance with Section 01 78 00 - Closeout Submittals.

.2 After award of Contract, Consultant will provide 2 sets of white print drawings for purpose of maintaining record drawings. Using Red Ink, accurately and neatly record deviations from Contract Documents caused by site conditions and changes ordered by Consultant.

.3 Record locations of concealed components of electrical services.

.4 Identify drawings as “Project Record Copy”. Maintain in new condition and make available to Consultant for inspection on-site and at all job meetings.

.5 On completion of Work and prior to final inspection, submit record documents to Consultant for preparation of “As-Built” transparencies.

1.16 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Section 01 61 00 – Common Product Requirements.

.2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.

.3 Control panels and component assemblies shall be factory assembled.

1.17 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor equipment "equipment green" finish to EEMAC Y1-1, latest revision.

.2 Paint indoor enclosures light grey to EEMAC 2Y-1, latest revision.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.18 LOCATION OF OUTLETS

.1 Locate outlets as shown on drawings or as indicated below.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate outlets at casework and in typical rooms as per architectural casework details and wall elevations

.5 Install polyethylene vapor barrier box on all exterior wall outlets to maintain vapor barrier integrity.

1.19 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Telephone and interphone outlets: 300 mm.

.2 Wall mounted telephone, payphone or interphone outlets: 1200 mm.

.3 Television outlets: 300 mm.

.4 Clocks: 2100 mm.

.4 Coordinate device heights with architectural room and casework elevations.

.5 Generally, masonry outlet boxes are to be installed in bottom of concrete boxes to approximate heights indicated.

.6 Refer to all detail drawings and confirm mounting of devices prior to roughing-in.

1.20 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduit and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

.4 All core drilling patching and firestopping of penetrations through walls and floors shall be the responsibility of the General Contractor.

.5 Core drill through walls and floor, as required. Submit exact locations and sizes to Consultant for approval prior to drilling.

.6 Any required trenching of floors, or removal of existing T-bar ceilings for the running of conduit or cables shall be the responsibility of the General Contractor, unless stated otherwise on drawings.

.7 Install cables in cable tray per CSA C22.1, latest revisions.

.8 Seal all conduits which enter air handling units in accordance with CEC rule 22-302.

1.21 FIELD QUALITY CONTROL

.1 All communication work to be carried out by qualified, IBDN certified technician.

.2 Conduct and pay for following tests:

.1 Structured cable system test results

.3 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

.4 Carry out tests in presence of Consultant.

.5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.6 Prior to expiration of the construction warranty, the Owner will carry out functional performance testing. The contractor shall cooperate fully with the Department of Supply and Services request for warranty service and pay all associated costs.

.7 Notify Consultant three (3) working days in advance of equipment and system testing and verification. Failure to comply may result in retesting of systems at the contractor’s expense.

.8 Submit test results for Consultant's review.

1.22 AUTHENTIC MANUFACTURER

.1 Only authentic manufacturer equipment purchased through an authorized distributor shall be accepted. Refurbished or used equipment are not acceptable and if found will be replaced by authentic parts at contractor expenses.

PART 2 Products

2.1 NOT USED

.1 Not Used.

PART 3 Execution

3.1 WORKMANSHIP

.1 All connections and terminations shall be securely tightened so that heat cycling over the life of the equipment does not result in loose or overheated connections. Lugs, terminals, and wire shall be compatible materials not subject to electrolytic corrosion.

.2 All equipment, conduit, and wiring shall be installed to avoid interferences with other equipment or working spaces. Layout all work in consultation with other trades and suppliers. Adhere to manufacturers shop drawings to locate conduits and terminations. Keep equipment and wiring clear of high temperature areas, where possible.

.3 When handling equipment, ensure that only proper lifting lugs or jacking pads are used, and that slings are clear of equipment.

.4 All equipment shall be properly leveled, plumbed, shimmed, secured in place, and grouted where necessary. Equipment shipped in pieces shall be securely assembled using all bolt holes provided.

.5 Where applicable, equipment shall be mounted so as to permit access by operations or maintenance personnel.

.6 At completion, thoroughly clean all equipment; remove conductive dust, scrap, tools, etc., before applying voltage.

.7 Contractor shall provide watertight weather protection to seal all openings to the exterior required by this contract.

END OF SECTION

PART 1 General

1.1 DESCRIPTION OF WORK

.1 This section addresses the complete removal of electrical equipment that is obsolete, abandoned or made redundant by this Contract as specified. It also covers alteration of existing electrical services affected by renovations.

.2 Existing communication services including conduit and wire are to be relocated / rerouted as required to allow for renovations and new construction. This includes relocating/rerouting to accommodate other trades.

.3 Work include, but is not limited to, the following:

.1 New telephone and data outlets.

.2 Testing of equipment and cleaning of site.

.4 Refer to Section 27 00 10-Communications Installations General Requirements.

1.2 SITE SURVEY

.1 Prior to tender submission, visit the site and survey and quantify the extent of the removals / alterations required for this contract and include for all costs in the total tendered price. Any existing conditions (demolition) information indicated on the drawings is for general guidance only.

.2 In conjunction with the site visit, review architectural, mechanical and electrical drawings and include all costs due to existing conditions in total tendered price.

1.3 REFERENCE STANDARDS

.1 All removal or modification work of electrical construction to be done in accordance with the safety standards outlined in the Canadian Electrical Code and Occupational Health and Safety Act.

1.4 PROTECTION

.1 The Contractor is responsible for any damages to existing structure as a result of the work.

1.5 SALVAGE MATERIAL

.1 Materials and equipment identified on the drawing to be reused are to be removed, stored, cleaned, and re-installed as required to allow for new construction.

.2 Prior to demolition, the Consultant shall be notified immediately of any damage to equipment or material intended for reuse.

1.6 DISPOSAL

.1 Prior to demolition, Owner will identify any items of electrical equipment which are to be set aside as directed for future use by Owner. All other materials and equipment removed under work of this Section becomes the property of the Contractor for disposal off the property

.2 Comply with all municipal, provincial and federal bylaws and standards when disposing of waste.

.3 Remove contaminated or dangerous materials as defined by Authorities having jurisdiction relating to environmental protection from site and dispose of in safe manner to minimize danger at site or during disposal.

PART 2 Products

2.1 NOT USED

.1 Not used

PART 3 Execution

3.1 GENERAL REMOVALS

.1 Remove all obsolete or abandoned communication services including wire and conduit, except those designated for reuse.

.2 Remove, relocate, extend and/or reinstall existing electrical services as required to accommodate other trades.

.3 Coordinate work of this Section with other trades.

.4 Schedule all removal work with the Owner and the General Contractor. Do not disrupt building operations except as permitted by the Schedule.

.5 Any conduit, wiring, boxes or equipment that is to remain in service is to be properly supported as required by the CEC. Any additional hangers, straps or fasteners required are to be supplied under this contract.

.6 Make alterations to existing electrical services as required and make good all circuits affected by the renovations.

.7 Any relocating of existing equipment and any rerouting of existing wire and conduit to coordinate with new work to be included in total tendered price.

.8 Perform all related shutdown work before hand to keep down-time to a minimum. Once a shutdown is taken, work must progress continuously until communication is restored.

.9 Coordinate all work with Utilities as required. Include all Utility costs for work in contract price.

3.2 CUTTING

.1 Cutting required for removals and alterations to be to the approval of the Consultant and performed with appropriate power tools.

3.3 CLEANING

.1 Reused existing equipment shall be cleaned in accordance with Section 27 00 10.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 27 00 10 - Communication Systems General Requirements

1.2 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.2 Nameplates:

.1 Lamicoid 3 mm thick plastic engraving sheet, white face, black core for non-essential power equipment, red face, white core for equipment on essential power, mechanically attached with self tapping screws.

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.3 Labels:

.1 Embossed plastic labels with 6 mm high letters unless specified otherwise.

.4 Wording on nameplates and labels to be approved by Consultant prior to manufacture.

.5 Allow for average of twenty-five (25) letters per nameplate and label.

.6 Identification to be Bilingual: English and French.

.7 Use one label for both languages.

.8 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics. Label both box and cover.

.9 Nameplates for control panels indicate equipment being controlled and voltage, phase, no. of wires, designated power source, branch circuit breaker numbers.

.10 Pull boxes: indicate system and voltage.

.11 Terminal cabinets and pull boxes: indicate system and voltage.

.12 All data, telephone and cable TV outlets shall have a transparent circuit identification permanently installed on coverplate. Acceptable product: Panduit #LS5 c/w LS5-530 tape or equivalent.

1.3 WIRING IDENTIFICATION

.1 Identify wiring (including neutral conductors) with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring including in all junction boxes/ pull boxes located between.

.2 Markings shall indicate panel and circuit number; i.e., A1-27. Normal ground circuits to have ground, neutral and phase wires identified with black on white background tape or insulation.

.3 Tape to be vinyl, self-adhesive Electrovert Type Z Markers or equivalent.

.4 Use coloured plastic tapes to identify feeders on both ends of phase conductors and at junction and pull boxes of conductor insulation colours are other than re, black, blue, white and green.

.5 Maintain phase sequence and colour coding throughout.

.6 Colour code: to CSA C22.1.

.7 Use colour coded wires in communication cables, matched throughout system.

1.4 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	**Auxiliary**
Telephone	Blue	
Data	Green	
Public Address System	Green	Turquoise
CCTV System	Orange	Pink

Cable TV	Turquoise	Green
Intercom	Turquoise	Pink
Clock	Pink	Blue
Dictation	Yellow	Green
Low Voltage	White	

1.5 WIRING TERMINATIONS

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.6 MANUFACTURERS AND CSA LABELS

.1 Visible and legible, after equipment is installed.

1.7 WARNING SIGNS

.1 As specified and to meet requirements of Electrical Inspection Department and Consultant.

.2 Porcelain enamel signs, minimum size 175 x 250 mm.

PART 2 Not Used

2.1 NOT USED

.1 Not Used

PART 3 Not Used

3.1 NOT USED

.1 Not Used

END OF SECTION

PART 1 General

1.1 RELATED WORK

.1 Section 27 00 10 – Communication Installations General Requirements.

PART 2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended on walls and ceilings.

.2 Threaded rods.

.3 Beam clamps

.4 J-Hooks

PART 3 Execution

3.1 INSTALLATION

.1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.

- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 1.5 m oc spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

PART 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Section 27 00 10 Communication Installations General Requirements.

PART 2 Products

2.1 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.2 ACCEPTABLE MANUFACTURER

.1 Acceptable manufacturers: Bel, Eurobex, Hammond.

PART 3 Execution

3.1 JUNCTION, PULL BOXES AND CABINET INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.2 WIRING IN UNDERGROUND JUNCTION BOXES

.1 Provide compression type connectors and heat shrink wrap for all underground connections.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 27 00 53 – Identification for Communications Systems.

.2 Install size 2 identification labels to indicate system name.

END OF SECTION

Approved: 2008-07-22

PART 1 General

1.1 REFERENCES

.1 CSA C22.1- latest revision, Canadian Electrical Code, Part 1.

.2 CSA C22.2 No. 45- latest revision, Rigid Metal Conduit.

.3 Section 27 00 10 – Communications Installations General Requirements

PART 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.3 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster walls.

2.3 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 EMT fittings to be set screw steel.

.3 Knock-out fillers to prevent entry of debris.

.4 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.5 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

.5 Install all outlet boxes in exterior walls with flexible vapor barrier and seal with caulking.

.6 No device boxes (electrical, data, nurse call, etc.) shall be back to back. The device boxes must be offset by a minimum of 15cm (6 inches) if located within the same wall cavity.

END OF SECTION

PART 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CAN/CSA C22.2 No. 18-latest revision, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
- .2 CSA C22.2 No. 45- latest revision, Rigid Metal Conduit.
- .3 CSA C22.2 No. 56- latest revision, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83- latest revision, Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2- latest revision, Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3- latest revision, Flexible Nonmetallic Tubing.

1.2 RELATED SECTIONS

.1 Section 27 00 10 – Communications Installations General Requirements.

1.3 LOCATION OF CONDUITS

.1 Drawings do not indicate all conduit runs. Those indicated are in diagrammatic form only.

.2 Contractor shall be familiar with building ceiling spaces. Most conduit runs shown as straight runs will consist of several offsets due to services equipment. Contractor may propose alternate paths to achieve similar aims after detailed review of site conditions.

PART 2 Products

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

2.2 CONDUIT FASTENINGS

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

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 3000 m oc.

.4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90º bends are required for 25 mm and larger conduits.

.3 Set-screws connectors and couplings for EMT.

2.4 FISH CORD

.1 Polypropylene.

2.5 IDENTIFICATION

.1 Color code conduits in accordance with Section 27 00 53 – Identification for Communications Systems.

PART 3 Execution

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms in unfinished areas.

.3 Use rigid electrical metallic tubing (EMT) conduit except where specified otherwise.

.4 Use rigid pvc conduit underground.

.5 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.6 Mechanically bend steel conduit over 21 mm dia.

.7 Install fish cord in empty conduits.

.8 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.9 Dry conduits out before installing wire.

.10 Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.

.11 Seal around all conduits where they pierce walls to eliminate sound transmission.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

.7 Unless approved in writing by Consultant, surface conduits are acceptable only in electrical, communication and mechanical rooms.

.8 Ground all EMT stubs as per CEC.

3.3 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

.4 Conduits shall be installed on the warm side of vapour barrier where possible with vapour barrier penetrations kept to minimum.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 27 00 10 – Communication Installations General Requirements.

.2 Section 27 05 33 – Conduits and Backboxes for Communication Systems

.3 Section 27 05 31 – Junction Boxes, Pull Boxes and Cabinets for Communications Systems

.4 Section 27 00 53 – Identification for Communications Systems

1.2 REFERENCES, STANDARDS AND CODES

.1 As minimum standards, product and installation to:

- .1 ANSI/TIA/EIA-568-B.1-3, latest revision: Design Guidelines for Telecommunications Wiring Systems in Commercial Buildings.
- .2 ANSI-J-STD-607-A-2002, latest revision: Commercial Building Grounding and Bonding Requirements for Telecommunications.
- .3 Canadian Electrical Code, Part 1.
- .4 ANSI/TIA/EIA-606-A.2002, latest revision: Administration Standard for Commercial Telecommunications Infrastructure.
- .5 BICSI TDMM 10th edition.
- .6 CAN/CSA-T527, latest revision, Grounding and Bonding for Telecommunications in Commercial Buildings.
- .7 CAN/CSA-T530, latest revision, Building Facilities, Design Guidelines for Telecommunications.
- .8 CAN/CSA-T529, latest revision, Design Guidelines for Telecommunications Wiring System in Commercial Buildings.
- .9 CAN/CSA-C22.2 No. 214, latest revision, Communications Cables.
- .10 CAN/CSA-C22.2 No. 182.4, latest revision, Plugs, Receptacles, and Connectors for Communication Systems.
- .11 EIA/TIA Bulletin TSB-36, Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted Pair Cables, Electronic Industries Association (USA), November 1991, latest revision.
- .12 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
- .13 EIA/TIA Bulletin TSB 36, Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted Pair Cables, Electronic Industries Association (USA), November 1991, latest revision.
- .14 TIA/EIA Telecommunications Systems Bulletin TSB40, Additional Transmission Specifications for Unshielded Twisted Pair Connecting Hardware, Telecommunications Industry Association, August 1992, latest revision.

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.

.2 Installed in physical star configuration with separate horizontal and backbone sub-systems. Horizontal cables link work areas to telecommunications closet located on same floor. Telecommunications closets linked to central equipment room by backbone cables.

.3 The Telephone system consist of outlet boxes, coverplates, conduits, pull boxes, sleeves and caps, fish wires, cables, cable tray, bix panel and c/w distribution connector.

.4 The Data system consists of outlet, boxes, coverplates, conduits, pull boxes, sleeves and caps, fish wires, cables, cable tray, floor mounted rack and patch panel.

.5 Cables to be installed from telephone service entrance to outlets by this division.

.6 Incoming cable of telephone entrance to communication room will be by communication utility. Raceways and conduits by this division. All cross connections between utility voice patch panel and customer patch panel shall be done by communication utility.

.7 Quality Assurance:

.1 Data and voice cabling, terminations and testing shall be performed by an end to end "Certified System Vendor", or "Factory Authorized Contractor", and shall be "IBDN Certified", and have a 25 year passive component guaranty.

.2 Cabling installation shall be by a current Registered Communications Distribution Designer governed by BICSI. The company responsible for the work shall provide confirmation that the RCDD has performed weekly inspections, and attended job meetings, and shall provide RCDD stamped "As-Built Record Drawings", for all telecommunications infrastructure installed under their contract.

.3 Upon completion of the installation, the system must be certified by the installer and the manufacturer that it will meet or exceed Category 6 and 1000 Base T applications for data and voice.

PART 2 Products

2.1 MATERIAL

.1 Conduits: EMT type, to Section 27 05 33 – Conduits and Backboxes for Communication Systems.

.2 Junction boxes: to Section 27 05 31 – Junction Boxes, Pull Boxes and Cabinets for Communication Systems.

.3 Fish wire: polypropylene type.

.4 All "Permanent Link" components shall be from the same manufacturer.

2.2 UNSHIELDED TWISTED PAIR (UTP) CABLE – FOR VOICE AND DATA SYSTEM

.1 Unshielded, twisted, four (4) pair, solid copper core with overall polyvinyl chloride jacket, 100 ohm, 24 AWG, polyolefin (PE) insulation, non parallel twists, 100±15 ohm from 1 MHz to 100 MHz, 100±32 ohm from 201 MHz to 300 MHz, 24 AWG, FT6 rated insulation, yellow jacket for data and blue jacket for voice, Category 6, 1000BASE-T Ethernet, certified by manufacturer for transmission speeds up to 2.4 Gbps at a minimum bandwidth of 250 MHz, ATM at all speeds up to 2.4 Gb/s and Broadband video (77 channels at 550 Mhz).

.2 Cabling must meet or exceed ANSI/TIA/EIA-568-B.2, CAN/CSA T529-95 and ICES S90 661, latest revision.

.3 Channel performance criteria should meet or exceed the following:

Frequency (MHz)	100	250
Attenuation	19.9	33.0
Next pair to pair	44.3	38.3
ACR Channel	24.4	5.3
ELFEXT pair to pair	27.8	19.8
ELFEXT Powersum	25.8	17.8
Return Loss	20.1	17.3

.4 Manufacturer or approved equal:

.1 Belden/CDT IBDN Gigaflex 2412 (yellow for data and blue for voice).

.2 Burktek

.3 Panduit

.4 Avaya

2.3 VOICE & DATA OUTLETS

.1 Single or multi modular (8 position; 8 pin) outlets as indicated, CSA listed.

.2 Meets or exceeds requirements of EIA/TIA-568 for CAT 6 for voice and data.

.3 Modular jack contact wires:

.1 Minimum 50 micro-inches hard gold plating over nickel.

.2 Meets FCC Part 68 Sub-part F requirements.

.4 Performance:

.1 Current rating: 1.5 amps max.

.2 Durability: 750 mating cycles.

.3 Contact pressure: 100 grams min.

.5 Wiring configuration T568A (ISDN).

.6 Suitable for flush mounting in single gang coverplate.

.7 White four port angled entry faceplate and cover. Provide blanking fillers for unused ports.

.8 Acceptable manufacturers:

.1 Belden/CDT #AZ0645269 four port angled coverplate Gigaflex PS6+ Module AX101063 for voice and data.

.2 Panduit

.3 Hubbell

.4 Avaya

2.4 CABLE SUPPORTS

.1 Horizontal cables installed directly in ceiling cavity must be supported so they are not laying on top of the ceilings.

.2 Use J-hook support clips, Caddy "CableCat Clip" or approved equal at 1200mm spacing.

2.5 IDENTIFICATION

.1 As per Section 27 00 53 - Identification for Communications Systems.

.2 Each data outlet faceplate to be identified with a computer label.

.1 Acceptable manufacturer or approved equal:

.1 Panduit

.2 Hubbell

.3 Each modular jack to be identified with an alpha/numeric label

.1 Acceptable manufacturer or approved equal:

.1 Panduit

.2 Hubbell

.4 Each horizontal cable to have identification markers installed on both ends.

.5 Each patch panel to have corresponding labeling.

.6 Labelling to indicate Building Code (AC), Floor (1), Room Number (303) and outlet (101), i.e. SB303-101.

PART 3 Execution

3.1 INSTALLATION OF HORIZONTAL DISTRIBUTION CABLES

.1 Install OFC, CXC and UTP horizontal cables, as indicated in ceiling space from termination in telecommunications closet to outlets.

.2 Install OFC and CXC cables, as indicated in equipment room.

.3 Each cable is to be installed in one continuous run from the patch panel in the communications room, to the workstation or phone (i.e. no breaks).

.4 Each data cable must be terminated with modular female RJ45 components at both ends.

.1 The connectors at the patch panel and at the jack must be of the same manufacturer and model. The connectors at the workstation end will be installed in MDVO side entry in the case of modular furniture or by using wall plates in finished walls at each drop location.

.2 The components must be configured to support four position EIA/TIA, ISDN cabling, 1000 Base T standard.

.3 The component installation must meet or exceed technical criteria outlined in the T529-95 Telecommunication Cabling in Commercial Buildings Standard.

.5 Data cable is to be hard-cabled directly to the patch panel connector at one end, and to the workstation connector at the other with no interim connections or splices such that the total length does not exceed 90 m.

.6 Separate dedicated wall-mounted rack with RJ45 patch panels is to be used for voice cabling terminations at entrance facility. Voice cabling will be hard-cabled directly to the patch panel in the communications room by the utility. Contractor is to install patch cords with a male RJ45 connector from the patch panel to building user's rack.

.7 The cable twist must be maintained up to the connection points at both ends of the cables. A maximum of 13 mm of the cable jacket, measured from the connection point will be removed.

.8 Colour match conductors on terminal strip in accordance with C22.2 No. 214 and CAN/CSA T529. For IDC type connections, use tool with seating and cutting heads for connecting conductors to terminals.

.9 The data cables connected to each row of RJ45 patch panel jacks should be dressed horizontally, collected together, and tie-wrapped as a group. Each group of cables should be routed to the vertical troughs in a straight line parallel to the floor and not be allowed to hang loosely.

.10 Cable bends 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.

.11 In spaces with UTP terminations, cable bend radii shall not be less than eight times the cable diameter.

.12 A minimum length of one meter of slack for each cable must be left above the termination rack in the server room.

.13 A 75 mm clearance between data cables and AC power conduits 300 mm clearance from fluorescent luminaries shall be maintained.

.14 For distribution of television signals, terminate CXC cable on type F connectors.

.15 Terminate OFC cables with ST and SC connectors.

.16 Cables shall extend minimum of 300 mm beyond box at outlet and 1000 mm beyond termination point at terminal. Do not coil slack in cable. Maximum conductor lengths of 90m from bix block or patch panel to outlet.

3.2 LABELLING

.1 A structured alpha numeric system will uniquely identify each component of the UTP cabling system.

.1 RJ45 patch panel ports located in the communications room are to be labeled from 01 to 06.

.2 Both ends of each data cable shall be labeled with the room ID and the patch panel port ID to which it is connected. The labels should be placed 6 to 12 inches from each jack or connector and secured with shrink wrap.

.3 Each installed RJ45 jack shall be labeled with the room ID and the patch panel port ID to which it is connected.

.2 All labels must be machine made and of professional quality. No hand-written identification will be accepted. All patch cord labels must be shrink wrapped to ensure permanent identification.

3.3 INSTALLATION OF DATA/VOICE OUTLETS

.1 Install data outlets and connect to cables. Use proper tool for punching down cables on terminals.

.2 Install ground bushings on conduits terminating at racks and bond supply end to common communications ground bus with # 6 AWG green insulated conductor.

.3 Cables shall extend minimum of 300 mm beyond box at outlet and 1000 mm beyond termination point at terminal. Do not coil slack in cable. Maximum conductor length from bix block to outlet – 90m.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 27 00 10 – Communication Installations General Requirements.

.2 All tests shall be completed with a level III tester.

.3 The Cabling Contractor must perform end to end testing to verify and ensure full functional capabilities. The testing of each cable must be performed on a pair to pair basis ensuring continuity and eliminating the possibilities of shorts or reversals. The cabling contractor to employ testing equipment which is based on TDR (Time Domain Reflectometry) technology. Testing will be done on each cable to ensure compliance to the transmission requirements outlined in this specification.

.1 Test for UTP performance to 1000 Base T, 160 MHz, Category 6, IEEE 802.3 Standards and compatible as ratified by EIA/TIA 568-B.2-1.

.4 The contractor will provide printouts of all test results which will include a record of the length of each drop and soft record of the testing results on CD's. The testing must be performed on all cables terminated at workstations and cables left coiled and terminated in the ceiling at each grid zone.

.5 All testing is required to be implemented in both directions (panel to jack, jack to panel).

.6 In order to ensure proper tester set up and accurate length readings for the subsequent cable tests, the contractor will be required to supply a 30 m length of the cable with male RJ45 jacks at each end to adjust Nominal Velocity of Propagation (NVP) to this known length. The 30 m length will then be kept by the user.

.7 The documentation of test results will be given in report form and will contain the following data:

OPERATOR: DATE:
LOCATION: CABLE TYPE:
CABLE #: TESTER, MAKE & MODEL:
TEST RESULTS (PAIRS)
PINS 1,2 \ PINS 3,6 \ PINS 4,5 \ PINS 7,8
LENGTH:
ATTENUATION:
NOISE:
RESISTANCE:
NEXT (dB):
NEXT (FREQ.):
ACTUAL MAP – NEAR, FAR PASS OR FAIL (100 MBS)

.8 Test optical fibre cables for:

.1 End-to-end loss at 1300 nm.

.2 OTDR tests.

.9 Test coaxial cables for:

.1 Continuity.

.2 Attenuation at 100 MHz.

.10 Cables failing test shall be replaced by electrical contractor, at contractor expense.

3.5 DOCUMENTATION & CERTIFICATION

.1 Hard and soft copies (CDS) of all required UTP cable test results including attenuation test results.

.2 The same individual snap-in type modular connectors will be utilized at both ends of the cable. The connectors at the patch panel and at the jack must be of the same model and manufacturer.

.3 A certification document must be issued by the cable/component manufacturer guaranteeing installation techniques for UTP cable and cabling components and carry a minimum 15 year certification from the manufacturer for the capability to support gigabit applications such as 1000 Base-T, 622 Mb/s and 2.4 Gb/s ATM. A worst case channel performance incorporates manufacturer certified patch cords.

.4 The installation technicians must be certified through a manufacturer's certification program and must be capable of providing evidence of their training certification. The contracting firm must supply documentation verifying their current participation in a manufacturer's certification program. Upon request and at no additional cost to Owner, the contactor must provide a manufacturer's technical representative to conduct an on-site visit to ensure complete technical compliance.

.5 Upon request and at no additional cost to Owner, the contractor shall provide a manufacturer's technical representative to conduct an on-site visit to ensure complete technical compliance.

.6 The manufacturer's certification must guarantee that design or installation negligence on the part of the certified contractor will not negate or void any portion of the certified system. The manufacturer must guarantee that all material, components and Labour are covered n this circumstances for the full certification period. It must also guarantee that in the event a contractor is no longer in business, the full certification remains valid.

.7 Written acknowledgement of these conditions must be provided prior to award of the contract.

END OF SECTION