DEI Consulting Engineers
MECHANICAL | ELECTRICAL | AQUATIC

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RE: Durham College IT Alumni Affairs - Reno
Oshawa, Ontario

Job #: 18299

Attn: Mr. Robert Ferkul, M.Arch. OAA Partner/Ms. Neda Pavela-Mogus, M.Arch, OAA Architect/
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ELECTRICAL ADDENDUM

ELECTRICAL

Item 1

1.0 Reference Electrical Specifications

.1 Electrical specification is to be included as part of the Tender documentation.

Item 2

2.0 Reference Drawing E1.1 and Attached Re-issued Drawing E1.1

.1 In the light fixture schedule, delete fixture type 'L4'.

.2 In the equipment wiring schedule, add items 4 and 5 (AC-1 and CU-1) as per re-issued drawing E1.1.

.3 In the legend, add devices as per re-issued drawing E1.1.

Item 3

3.0 Reference Drawing E2.1 and Attached Re-issued Drawing E2.1

.1 On detail 'A' (Enlarged south Hall IT Room #0096 plan) new rack, cable tray and associated devices have been added as per re-issued drawing E2.1.

.2 In the specific renovation notes, notes #6 – #14 have been added as per re-issued drawing E2.1.

.3 Heater schedule added as per re-issued drawing E2.1.

Item 4

4.0 Reference Drawing E3.1 and Attached Re-issued Drawing E3.1

.1 Add panel schedule Panel "GEN" to drawing as per re-issued drawing E3.1.

.2 Add distribution riser automatic transfer switch as per re-issued drawing E3.1.

.3 Add lighting control diagram and typical room lighting elevations as per re-issued drawing E3.1

Item 5

5.0 Reference Drawing E4.1 and Attached Re-issued Drawing E4.1

.1 On the renovation lighting plan, add lighting controls as per re-issued drawing E4.1. In Storage 2097, revise the two type 'L1' fixtures to be type 'L3'. In Storage 2097A, revise the type 'L4' fixture to be type 'L3'.

.2 On the renovation power/systems plan revisions including circuiting is shown as per re-issued drawing E4.1.

.3 On the enlarged Universal Washroom plan, devices are now shown as per re-issued drawing E4.1.

.4 In the specific renovation notes, notes #10 – #15 have been added as per re-issued drawing E4.1.

Kevin Fox, C. Tech.

18299 Addendum (Elect) (re-issued dwgs E1.1, E2.1, E3.1, E4.1) Dec 20 18.docx
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SIMCOE VILLAGE RENOVATIONS 2019

for
DURHAM COLLEGE

ELECTRICAL SPECIFICATIONS
Volume 2

MOFFET & DUNCAN ARCHITECTS INC.
PRIME CONSULTANT

RAVENS ENGINEERING INC.
STRUCTURAL ENGINEERS

DEI CONSULTING ENGINEERS
MECHANICAL & ELECTRICAL CONSULTANTS

Division 26 Common Requirements for Electrical

Division 27 Communications

Division 28 Electronic Safety and Security

END OF SECTION

Part 1 General

1.1 GENERAL INSTRUCTIONS

.1 Comply with the General Conditions, Supplementary Conditions, and all of General Requirements, Mechanical and Electrical Divisions.

1.2 FEES

.1 The contractor is to general inspection fees in tender.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This Section covers items common to Electrical Divisions.

.2 This section supplements requirements of Division 1.

.3 Furnish labour, materials, and equipment necessary for completion of work as described in contract documents.

1.2 INTENT

.1 Mention herein or indication on Drawings of articles, materials, operations, or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated: and, performance of each operation prescribed with furnishing of necessary labour, equipment, and incidentals for electrical work.

.2 Where used, words “Section” and “Division” shall also include other Subcontractors engaged on site to perform work to make building and site complete in all respects.

.3 Where used, word “supply” shall mean furnishing to site in location required or directed complete with accessory parts.

.4 Where used, word “install” shall mean secured in place and connected up for operation as noted or directed.

.5 Where used, word “provide” shall mean supply and install as each is described above.

1.3 TENDERS

.1 Submit tender based on specified described equipment or Alternates listed.

1.4 LIABILITY INSURANCE

.1 This contractor must maintain and produce at the request of the consultant proof of proper insurance to fully protect the Owner, the Consultant and the Contractor from any and all claims due to accidents, misfortunes, acts of God, etc.

1.5 DRAWINGS

.1 Electrical Drawings do not show structural and related details. Take information involving accurate measurement of building from building drawings, or at building. Make, without additional charge, any necessary changes or additions to runs of conduits and ducts to accommodate structural conditions. Location of conduits and other equipment may be altered by Consultant without extra charge provided change is made before installation and does not necessitate major additional material.

.2 As work progresses and before installing fixtures and other fittings and equipment which may interfere with interior treatment and use of building, provide detail drawings or obtain directions for exact location of such equipment and fitments.

.3 Electrical drawings are diagrammatic. Where required work is not shown or only shown diagrammatically, install same at maximum height in space to conserve head room (minimum 2200 mm (88") clear) and interfere as little as possible with free use of space through which they can pass. Conceal wiring, conduits and ducts in furred spaces, ceilings and walls unless specifically shown otherwise. Install work close to structure so furring will be small as practical.

.4 Before commencing work, check and verify all sizes, locations, grades, elevations, levels and dimensions to ensure proper and correct installation. Verify existing/municipal services.

.5 Locate all electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.

.6 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install services so that necessary installation and connections can be made for any such apparatus. Obtain instructions whenever necessary for this purpose.

.7 Relocate equipment and/or material installed but not co-ordinated with work of other Sections as directed, without extra charge.

.8 Where drawings are done in metric and product not available in metric, the corresponding imperial trade size shall be utilized.

1.6 INTERFERENCE AND CO-ORDINATION DRAWINGS

.1 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the constructed spaces provided.

.2 Prepare drawings to indicate co-ordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are co-ordinated.

.3 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance are indicated on drawings.

.4 Upon consultant’s request submit copies of interference drawings to consultant.

1.7 QUALITY ASSURANCE

.1 The installations of the division must conform to the latest edition of the Electrical Safety Code as well as its supplemental bulletins and instructions. Provide materials and labour necessary to comply with rules, regulations, and ordinances.

.2 Complete underground systems in accordance with CSA C22.3 No. 7-94 except where specified otherwise.

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

.4 In case of differences between building codes, provincial laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Consultant in writing of such differences.

1.8 ALTERNATES AND SUBSTITUTIONS

.1 Throughout these sections are lists of "Alternate Equipment" manufacturers acceptable to Consultant if their product meets characteristics of specified described equipment.

.2 Each bidder may elect to use "Alternate Equipment" from lists of Alternates where listed. Include for any additional costs to suit Alternated used. Prices are not required in Tender for Alternates listed except where specifically noted as "Separate Price". Complete the Supplementary Tender Form.

.3 It is responsibility of this Division to ensure "Alternate Equipment" fits space allocated and gives performance specified. If an "Alternate Equipment" unit is proposed and does not fit space allotted nor equal specified product in Consultant's opinion, supply of specified described equipment will be required without change in Contract amount. Only manufacturers listed will be accepted for their product listing. All other manufacturers shall be quoted as substitution stating conditions and credit amount.

.4 If item of material specified is unobtainable, state in Tender proposed substitute and amount added or deducted for its use. Extra monies will not be paid for substitutions after Contract has been awarded.

1.9 EXAMINATION

.1 Site Inspection

.1 Examine premises to understand conditions, which may affect performance of work of this Division before submitting proposals for this work.

.2 No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

.2 Drawings:

.1 Electrical Drawings show general arrangement of fixtures, power devices, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.

.2 Consider Architectural, Mechanical, and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Electrical Drawings.

.3 Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

.3 Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

1.10 SEQUENCING AND SCHEDULING

.1 It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of Contract Documents. Anything not clear or in conflict will be explained by making application to Consultant. Should conditions arise where certain changes would be advisable, secure Consultant's approval of these changes before proceeding with work.

.2 Coordinate work of various trades in installing interrelated work. Before installation of electrical items, make proper provision to avoid interferences in a manner approved by Consultant. Changes required in work specified in these sections caused by neglect to do so shall be made at no cost to Owner.

.3 Arrange fixtures, conduit, ducts, and equipment to permit ready access to junction boxes, starters, motors, control components, and to clear openings of doors and access panels.

.4 Furnish and install inserts and supports required by these sections unless otherwise noted. Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne by the electrical trade.

.5 Adjust locations of ducts, conduits, equipment, fixtures, etc, to accommodate work from interferences anticipated and encountered. Determine exact route and location of each conduit and duct prior to installation.

.1 Make offsets, transitions, and changes in direction of ducts, and electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings. Make offsets, transitions, and changes in direction of ducts, and electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.

.2 Supply and install pull boxes, etc, as required to effect these offsets, transitions, and changes in direction.

1.11 DRAW BREAKDOWN

.1 This Contractor MUST submit a breakdown of the tender price into classifications to the satisfaction of the Consultant, with the aggregate of the breakdown totaling the total contract amount. **Each item must be broken out into material and labour costs.** Progress claims, when submitted are to be itemized against each item of the draw breakdown. This shall be done in table form showing contract amount, amount this draw, total to date, % complete and balance.

.2 Breakdown shall be as follows:

.1 Permits and fees

.2 Mobilization (maximum 1%)

.3 Demolition

.4 Panelboards and miscellaneous distribution equipment

.5 Automatic transfer switch

.6 Feeder conduits

.7 Branch conduits

.8 Feeder cables

.9 Branch wiring

.10 Lighting fixtures (interior)

.11 Emergency lighting

.12 Lighting controls

.13 Fire alarm system components

.14 Voice/Data system

.15 Starters, contactors and control devices

.16 Wiring for mechanical equipment

.17 Electrical contractor closeout requirements (minimum of 3% but not less than $5,000.00)

.3 The breakdown must be approved by the Consultant prior to submission of the first draw.

.4 Breakdowns not complying to the above will not be approved.

.5 Breakdown must indicate total contract amount.

.6 Mobilization amount may only be drawn when all required shop drawings have been reviewed by the consultant.

1.12 SHOP DRAWINGS AND PRODUCT DATA

.1 General

.1 Furnish complete catalog data for manufactured items of equipment to be used in the Work to Consultant for review within 30 days after award of Contract.

.2 Provide a complete list of shop drawings to be submitted prior to first submission.

.3 Before submitting to the Consultant, review all shop drawings to verify that the products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers, and similar data and that it has checked and coordinated each shop drawing with the requirements of the work and of the Contract Documents. The Contractor's review of each shop drawings shall be indicated by stamp, date and signature of a qualified and responsible person possessing by the appropriate authorization.

.4 If material or equipment is not as specified or submittal is not complete, it will be rejected by Consultant.

.5 Additional shop drawings required by the contractor for maintenance manuals, site copies etc., shall be photocopies of the "reviewed" shop drawings. All costs to provide additional copies of shop drawings shall be borne by the contractor.

.6 **Submit all shop drawings for the project as a package. Partial submittals will not be accepted**.

.7 Catalog data or shop drawings for equipment, which are noted as being reviewed by Consultant or his Engineer shall not supersede Contract Documents.

.8 Review comments of Consultant shall not relieve this Division from responsibility for deviations from Contract Documents unless Consultant's attention has been called to such deviations in writing at time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.

.9 Check work described by catalog data with Contract Documents for deviations and errors.

.10 Shop drawings and product data shall show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances. e.g. access door swing spaces.

.11 Shop drawings and product data shall be accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Manufacturer test data where requested.

.3 Manufacturer to certify as to current model production.

.4 Certification of compliance to applicable codes.

.12 State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions, and other pertinent information. List on catalog covers page numbers of submitted items. Underline applicable data.

.13 Once these shop drawings are returned “reviewed” or “reviewed as noted” fabrication, production, and installation may commence. **NOTE: If a shop drawing is returned “reviewed as noted” this Contractor must provide written indication that the comments have been complied with.**

A partial list of shop drawings includes:

.1 Panelboards, and distribution equipment

.2 Automatic transfer switch

.3 Fire alarm system components

.4 Luminaires and drivers

.5 Emergency battery units and fixtures

.6 Starters, contactors and control devices

.7 Firestopping materials

.8 Wiring devices

.9 Cable management hangers

.10 Cable management system

.11 Occupancy sensors and lighting controls

.12 Voice/data system components

.13 Hand dryers

.2 Submissions shall be submitted electronically.

.1 Electronic Submissions:

.1 Electronically submitted shop drawings shall be prepared as follows:

.1 Use latest software to generate PDF files of submission sheets.

.2 Scanned legible PDF sheets are acceptable. Image files are not acceptable.

.3 PDF format shall be of sufficient resolution to clearly show the finest detail.

.4 PDF page size shall be standardized for printing to letter size (8.5"x11"), portrait with no additional formatting required by the consultant. Submissions requiring larger detail sheets shall not exceed 11"x17".

.5 Submissions shall contain multiple files according to section names as they appear in Specification.

.6 File names shall include consultant project number and description of shop drawing section submitted.

.7 Each submission shall contain an index sheet listing the products submitted, indexed in the same order as they appear in the Specification. Include associated PDF file name for each section.

.8 On the shop drawing use an “electronic mark” to indicate what is being provided.

.9 **Each file shall bear an electronic representation of the “company stamp” of the contractor. If not stamped the file submission will not be reviewed.**

.2 Email submissions shall include subject line to clearly identify the consultants’ project number and the description of the shop drawings submitted.

.3 Electronic attachments via email shall not exceed 10MB. For submissions larger than 10MB, multiple email messages shall be used. Denote related email messages by indicating “1 of 2” and “2 of 2” in email subject line for the case of two messages.

.4 Electronic attachments via web links (URL) shall directly reference PDF files. Provide necessary access credentials within link or as username/password clearly identified within body of email message.

.5 On site provide one copy of the “reviewed” shop drawings in a binder as noted above.

.6 Contractor to print **3** copies of “reviewed” shop drawings and compile into maintenance manuals.

1.13 CARE, OPERATION AND START-UP

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

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

.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.

1.14 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235-83.

.2 Motors, electric heating, control and distribution devices and 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.

1.15 PERMITS, FEES AND INSPECTION

.1 A submission has been made (if required by this size of project) by the consultant to the Electrical Safety Authority for review of this project. The payment of the required review costs will be co-ordinated by the consultant. A copy of the Electrical Safety Authority review report will be forwarded to the successful contractor for information and action.

.2 The contractor is required to include in his tender all required inspection costs by the Electrical Safety Authority. Permit application is the responsibility of the contractor.

.3 Reproduce drawings and specifications required by Electrical Safety Authority at no cost.

.4 Notify Consultant of changes required by Electrical Safety Authority prior to making changes.

.5 Furnish Certificates of Acceptance to Engineer from Electrical Safety Authority and other authorities having jurisdiction upon completion of work.

.6 This contractor must furnish any certificates required to indicate that the work completed conforms with laws and regulations of authorities having jurisdiction.

1.16 MATERIALS AND EQUIPMENT

.1 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 Safety Authority.

.2 Factory assemble control panels and component assemblies.

1.17 ELECTRIC MOTORS, EQUIPMENT, AND CONTROLS

.1 Supplier and installer responsibility is indicated in the Equipment Wiring Schedule on electrical drawings.

.2 Control wiring and conduit is specified in the Electrical specifications except for conduit, wiring and connections below 50 V, which are related to control systems specified in the Mechanical specifications.

1.18 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 electrical equipment "equipment green" finish.

.2 Paint indoor switchgear and distribution enclosures light grey.

.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, fastenings, and conduits etc. to prevent rusting.

1.19 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.2 Nameplates:

.1 Lamicoid 3 mm (1/8") thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES

Size 1	9 mm x 50 mm (3/8" x 2")	1 line	3 mm (1/8") high letters
Size 2	12 mm x 70 mm (1/2" x 2 1/2")	1 line	5 mm (3/16”) high letters
Size 3	12 mm x 70 mm (1/2" x 2 1/2")	2 lines	3 mm (1/8") high letters
Size 4	20 mm x 90 mm (3/4" x 3 1/2")	1 line	9 mm (3/8") high letters
Size 5	20 mm x 90 mm (3/4" x 3 1/2")	2 lines	5 mm (3/16") high letters
Size 6	25 mm x 100 mm (1" x 4")	1 line	12 mm (1/2") high letters
Size 7	25 mm x 100 mm (1" x 4")	2 lines	6 mm (1/4”) high letters

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

.4 Allow for average of twenty-five (25) letters per nameplate.

.5 Identification to be English.

.6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.7 Nameplates for disconnects, starters and contactors must indicate equipment being controlled and voltage.

.8 Nameplates for transformers must indicate transformer label as indicated and capacity, primary, and secondary voltages.

1.20 WIRING IDENTIFICATION

.1 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.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1.

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

1.21 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 (45') intervals.

.3 Colour bands must be 25 mm (1") wide.

	Prime
up to 208 V	yellow
209 to 600 V	white
Voice/Data System	orange
Fire alarm	red
Emergency lighting	pink

.4 This contractor must paint all system junction boxes and covers in conformance with the above schedule.

1.22 PROTECTION OF OPENINGS

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

1.23 WIRING TERMINATIONS

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

1.24 MANUFACTURERS AND CSA LABELS

.1 All labels must be visible and legible after equipment is installed.

1.25 WARNING SIGNS

.1 To meet requirements of Electrical Safety Authority and Consultant.

.2 Provide porcelain enamel signs, with a minimum size of 175 mm x 250 mm (7" x 10").

1.26 LOCATION OF OUTLETS

.1 Do not install outlets back-to-back in wall; allow minimum 150 mm (6") horizontal clearance between boxes.

.2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3 m (10'), and information is given before installation.

.3 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

1.27 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise. Coordinate with block coursing (if applicable).

.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 Local switches: 1100 mm (42").

.2 Wall receptacles:

.1 General: 400 mm (16").

.2 Above top of continuous baseboard heater: 200 mm (8").

.3 Above top of counters or counter splash backs: 100 mm (4").

.4 In mechanical rooms: 1200 mm (48").

.3 Panelboards: as required by Code or 1400 mm (56").

.4 Voice/Data outlets: At height of adjacent outlet or at 400 mm (16").

.5 Fire alarm stations: 1200 mm (3' - 11").

.6 Fire alarm visual and signal devices: 2250 mm (88 ½").

.7 Thermostat: 1200 mm (3’-11").

.8 Emergency call switches and/or pushbuttons: 900 mm (36").

1.28 LOAD BALANCE

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.29 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete shall be schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm (2") beyond either side.

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

1.30 FIELD QUALITY CONTROL

.1 Conduct and pay for following tests:

.1 Power distribution system including phasing, voltage, grounding, and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

.4 Motors and associated control equipment including sequenced operation of systems where applicable.

.5 Systems: fire alarm system, communications.

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

.3 Insulation resistance testing.

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.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 Submit test results for Consultant's review.

1.31 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings as indicated on drawings or as determined from co-ordination study.

1.32 GUARANTEE AND WARRANTY

.1 At the substantial completion stage of this project this Contractor must provide a written guarantee indicating that any defects, not due to ordinary wear and tear or improper use which occur within the first year from the date of substantial completion will be corrected at the contractors expense.

.2 Warranty period shall start from date of substantial completion.

1.33 SYSTEM START UP

.1 Provide consultant with written notice verifying all equipment operation and installation is complete prior to scheduled start-up period.

.2 Start up shall be in presence of the following: owner or representative, consultant, contractor, and manufacturer’s representative. Each person shall witness and sign off each piece of equipment.

.3 Arrange with all parties and provide 72 hours notice for start up procedure.

.4 Simulate system start up and shut down and verify operation of each piece of equipment.

.5 These tests are to demonstrate that the systems and equipment installed are operational as specified.

.6 The contractor must describe during the start up session the required maintenance for each piece of equipment according to the manufacturer.

.7 The contractor must provide all necessary tools (including a digital multimeter) to successfully complete the start up procedure.

1.34 OPERATION AND MAINTENANCE MANUAL

.1 Provide operation and maintenance data for incorporation into manual as specified in other Sections of this Division.

.2 Operation and maintenance manual to be approved by, and final copies deposited with, Consultant before final inspection. Make changes as requested and re-submit as directed by Consultant.

.3 Submit one manual for approval. Three manuals will be required at project completion. Each of which shall be in a three ring binder (minimum 50 mm (2") ring) labelled:

.1 Operation and Maintenance Manual.

.2 Project Name.

.3 Location.

.4 Each manual must include (in “tabbed” sections) the following:

.1 Index

.2 List of General, Mechanical, Electrical Contractors and all associated sub-contractor names, addresses and contact numbers.

.3 List of suppliers and equipment wholesalers local to the project.

.4 One year warranty letter for all parts, equipment and workmanship.

.5 List of manufacturers, spare parts list and source.

.6 Copy of typewritten schedules for all new and renovated panels.

.7 Receipt of spare fuses from owner's representative.

.8 Receipt of turned over keys for electrical panels.

.9 Final certificate from the Electrical Safety Authority.

.10 Final Fire alarm verification certificate and field technician device sheets.

.11 Certificate of exit/emergency lighting testing as per the specification.

.12 Copy of electrical shop drawings which have been stamped and reviewed by Consultant

.13 Any special warranties on equipment required (i.e. LED lighting and digital control).

.14 Certificate of completion from all associated sub-contractors.

.15 Cable test results and floor plans containing address labels.

.16 Automatic transfer switch test results.

.17 Lighting control system commissioning certificate and report.

.5 Upon acceptance of Operation and Maintenance Manual by the consultant, a pdf file of the entire manual is to be provided on a USB stick. Only one USB stick is to be provided containing both the approved manuals and record drawings.

1.35 RECORD DRAWINGS

.1 Site records:

.1 Contractor shall provide 2 sets of reproducible electrical drawings. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include field and contract changes to electrical systems.

.2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection at all times.

.2 Record drawings:

.1 Identify each drawing in lower right hand corner in letters at least 3 mm (1/8") high as follows: - "RECORD DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).

.2 Submit hard copy to Consultant for approval. When returned, make corrections (if any) as directed.

.3 Once approved, submit completed reproducible paper record drawings as well as a scanned pdf file copy on USB stick with Operating and Maintenance Manuals.

.3 The contractor will include in his tender a lump sum of $500.00 for DEI & Associates Inc. to CAD the Record drawings. The CAD drawings files will be provided to the owner as part of the maintenance manuals.

1.36 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Manufacturers or their representatives are to provide demonstrations and instructions.

.3 Use operation and maintenance manual, Record drawings, audio visual aids, etc. as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Where deemed necessary, Consultants may record these demonstrations on video tape for future reference.

1.37 SUBSTANTIAL PERFORMANCE

.1 Complete the following to the satisfaction of the consultant prior to submission of substantial performance.

.1 Record Drawings.

.2 Maintenance Manuals.

.3 System Start up.

.4 Instructions to Owners.

Final Certificates (Electrical Safety Authority, Fire Alarm, Emergency Lighting, Automatic Transfer Switch Test Certificate,Lighting Control System Commissioning Certificate).

1.38 TRIAL USAGE

.1 Consultant or owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

1.39 REVISION TO CONTRACT

.1 Provide the following for each item in a given change notice:

.1 Itemized list of material with associated costs.

.2 Labour rate and itemized list of labour for each item.

.3 Copy of manufacturers/suppliers invoice if requested.

1.40 EQUIPMENT SUPPORTS

.1 Equipment supports supplied by equipment manufacturer: shall be installed by the electrical contractor.

.2 Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel meeting requirements of - Structural Steel Section. Submit structural calculations with shop drawings if necessary.

.3 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm (4") high and 150 mm (6") larger than equipment dimensions all around. This installation of this pad shall be the responsibility of the electrical contractor.

.4 This contractor shall be responsible for providing all anchor bolts and associated formed concrete bases for lighting standards as detailed.

1.41 SLEEVES

.1 Pipe sleeves: at points where pipes pass through masonry, concrete, or fire rated assemblies and as indicated.

.2 Schedule 40 steel pipe.

.3 Sleeves with annular fin continuously welded at midpoint:

.1 Through foundation walls.

.2 Where sleeve extends above finished floor.

.4 Sizes: minimum 6 mm (1/4") clearance all around, between sleeve and conduit.

.5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm (1") above other floors.

.6 Through foundation walls PVC sleeves are acceptable.

.7 Fill voids around pipes:

.1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.

.2 Where sleeves pass through walls or floors, provide space for firestopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.

.3 Fill future-use sleeves with easily removable filler.

1.42 FIRESTOPPING

.1 Firestopping material and installation within annular space between conduits, ducts, and adjacent fire separation.

.2 Provide materials and systems capable of maintaining effective barrier against flame, smoke, and gases.

.3 Comply with the requirements of CAN4-S115-M35, and do not exceed opening sized for which they have been tested.

.4 Systems to have an F or FT rating (as applicable) not less than the fire protection rating required for closures in a fire separation. Provide “firewrap” blanket around services penetrating firewalls.

.5 Extent of blanket must correspond to ULC recommendations. In general wrap individual conduits with approved firewrap materials on each side of firewall. Refer to architectural drawings for FT ratings. Provide 1 and/or 2 layers of firewrap with transverse and longitudinal seams overlapped and/or butted (second layer offset from first layer). Cut edges are to be sealed with aluminum foil tape. Provide 50 mm stainless steel banding at 200 mm intervals. Install firewrap to manufacturers’ recommendations for proper FT rating. Acceptable manufacturers are 3M Firemaster ductwrap or approved equal.

.6 The firestopping materials are not to shrink, slump or sag and be free of asbestos, halogens and volatile solvents.

.7 Firestopping materials are to consist of a component sealant applied with a conventional caulking gun and trowel.

.8 Firestop materials are to be capable of receiving finish materials in those areas, which are exposed and scheduled to receive finishes.

.9 Firestopping shall be inspected and approved by local authority prior to concealment or enclosure.

.10 Install material and components in accordance with ULC certification, manufacturers instructions and local authority.

.11 Submit product literature and installation material on firestopping in shop drawing and product data manual.

.12 Acceptable manufacturers:

.1 Fyresleeve Industries Inc.

.2 General Electric Pensil Firestop Systems

.3 International Protective Coatings Corp.

.4 Rectorseal Corporation (Metacaulk)

.5 Proset Systems

.6 3M

.7 AD Systems

.8 Hilti

.9 Royal

Note: Fire stop material must conform to requirements of local authorities having jurisdiction. Contractor to confirm prior to application and ensure material used is compatible with that used by other trades on site.

.13 Ensure firestop manufacturer representative performs on site inspections and certifies installation. Submit inspection reports/certification at time of substantial completion.

1.43 PAINTING

.1 Refer to Section Interior Painting and specified elsewhere.

.2 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.

.3 Prime and touch up marred finished paintwork to match original.

.4 Restore to new condition, or replace equipment at discretion of consultant, finishes which have been damaged too extensively to be merely primed and touched up.

1.44 ACCESS DOORS

.1 Supply access doors to concealed electrical equipment for operating, inspecting, adjusting and servicing.

.2 Flush mounted 600 mm x 600 mm (24" x 24") for body entry and 300 mm x 300 mm (12" x 12") for hand entry unless otherwise noted. Doors to open 180º, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.

.3 Material:

.1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.

.2 Remaining areas: use prime coated steel.

.3 Fire rated areas: provide ULC listed access doors

.4 Installation:

.1 Locate so that concealed items are accessible.

.2 Locate so that hand or body entry (as applicable) is achieved.

.3 Installation is specified in applicable sections.

.5 Acceptable materials:

.1 Le Hage

.2 Zurn

.3 Acudor

.4 Nailor Industries Inc.

1.45 DELIVERY STORAGE & HANDLING

.1 Follow Manufacturer's directions in delivery, storage, and protection, of equipment and materials.

.2 Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or mechanical injury, but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in dry, heated space.

1.46 REPAIR, CUTTING, CORING AND RESTORATION

.1 Be responsible for required digging, cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of Consultant. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.

.2 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.

.3 Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

.4 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

.5 Slots, cores and openings through floors, walls, ceilings, and roofs shall be provided by this contractor but performed by a trade specializing in this type of work. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.47 EXISTING SYSTEMS

.1 Connections into existing systems to be made at time approved by Consultant. Request written approval of time when connections can be made.

.2 Be responsible for damage to existing plant by this work.

1.48 CLEANING

.1 Clean interior and exterior of all electrical equipment provided including light fixture lenses.

.2 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition.

1.49 DISCONNECTION AND REMOVAL

.1 Disconnect and/or remove equipment as indicated.

.2 Cap and conceal all redundant and obsolete connections.

.3 Provide a list of equipment to be removed to the owner, for his acceptance of same. Remove all equipment from site, which the owner does not retain.

.4 Store equipment to be retained by owner on site where directed by consultant.

1.50 ENCLOSURES

.1 This contractor must ensure that all electrical equipment mounted in sprinklered areas is provided with an enclosure in conformance with the Electrical Safety Code.

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

.1 Conform to the General Provisions of Division 1 and Electrical General Requirements Section.

.2 This project is one of a retrofit nature in part, and which will require extensive demolition.

.3 Allow for all remedial work in areas indicated on the drawings and as generally defined in the relevant sections of the specifications.

1.2 SCOPE OF WORK

.1 The scope of work is essentially the selected disconnection and/or removal of services and/or equipment, devices etc. as indicated or required to complete the work.

Part 2 Products

2.1 GENERAL

.1 This Division is to liaise with the Owners or Consultant for equipment being removed that may be suitable for reuse to that specified or handed over to the owner.

.2 This Division to take full responsibility for any special tools or equipment required to disassemble or remove material from building.

Part 3 Execution

3.1 GENERAL

.1 The general requirements are indicated on the drawings and on the outline specification in Division 1.

.2 The general execution of the demolition is to be carried out in a clean and efficient manner.

.3 Demolition of existing ceiling, walls etc., to facilitate removal of existing services or equipment or installation of new to be kept to a minimum and then restored to match existing.

.4 All openings or holes created by removal of existing electrical systems which are not being reused are to be patched with the same material surrounding surfaces.

.5 All new holes and openings to facilitate electrical systems are to be patched to match surrounding surfaces.

.6 Protect all existing furnishings materials and equipment. Any damage occurring as a result of the work of this Division shall be repaired or replaced at the expense of this Division.

.7 Where work involves breaking into or connecting to existing services, carry out work at times directed by the Owners in an expedient manner with minimum disruption to the facility and systems downtime.

.8 Where unknown services are encountered immediately advise Consultant and confirm findings in writing.

.9 Where the location of any services has been shown on the plans, such information is not guaranteed. It is this Division's responsibility to verify locations, etc., immediately after moving on site. Should for any reason the information obtained necessitates changes in procedure or design, advise the Consultant at once. If verification of existing conditions is not done at the outset and any problems arise, the responsibility for same is entirely this Division's.

.10 Disconnect and/or remove equipment, devices, cabling, services, etc. as indicated.

.11 Remove all redundant and obsolete systems, connections, and wiring.

.12 Provide a list of equipment to be removed to the owner, for their acceptance of same. Remove all equipment from site that the owner does not retain.

.13 Maintain equipment to be retained by owner on site where directed by consultant.

.14 Demolition of all parts of the work must be completed within the confines of the work area and in such a way as the dust produced and risk to injury of will not adversely affect the building users.

.15 Demolition shall take place within areas isolated from all other areas with appropriate hoarding, scaffolding, netting, fencing or other means of security between building users and the work.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.2 No.0.3-92, Test Methods for Electrical Wires and Cables.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger.

.2 Minimum size: 12 AWG.

.3 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material 90°C (194ºF) rated T90 for indoor above grade installations and RW90 for below grade installations.

2.2 ARMOURED CABLES

.1 Conductors: insulated, copper minimum size as indicated above.

.2 Type: AC90 (minimum size 12 AWG).

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors must be suitable for installed environment and approved for use with armoured cable.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring from source to load through raceways as specified.

.2 Provide separate neutral conductors for all lighting circuits and circuits originating from surge protected panels. Size raceways accordingly.

3.2 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with Wire and Box Connectors - 0 - 1000 V Section.

.3 These cables are to be installed in concealed locations only. These concealed locations are considered to be stud walls and “drops” to stud walls, lighting fixtures, and ceiling mounted devices.

.4 These “drops’ shall not be permitted to exceed 2.4 m (8'-0"). To limit these “drops” to lengths noted above provide additional branch wiring in conduit.

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 Electrical General Requirements Section.

Part 2 Products

2.1 MATERIALS

.1 Splitters must conform to CSA C22.2 No. 76 (latest edition).

.2 Junction and pull boxes must conform to CSA C22.2 No. 40 (latest edition)

2.2 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

.4 Splitter length must match arrangement of equipment unless indicated otherwise.

2.3 JUNCTION AND PULL BOXES

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

.2 Covers with 25 mm (1") minimum extension all around, for flush-mounted pull and junction boxes.

Part 3 Execution

3.1 SPLITTER INSTALLATION

.1 Install splitters and mount plumb, true and square to the building lines on 19 mm (3/4”) painted plywood backboards.

3.2 JUNCTION AND PULL BOXES INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Install junction and pull boxes so as not to exceed 30 m (100') of conduit run between pull boxes and in conformance with the Electrical Safety Code.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with General Electrical Requirements Section.

.2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Outlet boxes, conduit boxes, and fittings must conform to CSA C22.2 No. 18 (latest edition).

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

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

.2 102 mm (4") 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.

.5 347 V outlet boxes for 347 V switching devices.

.6 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 mm x 50 mm x 64 mm (3" x 2" x 2½") or as indicated. 102 mm (4") square outlet boxes when more than one conduit enters one side with extension and plaster rings as required. Iberville 1104 Series.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit **in utility rooms**, minimum size 102 mm x 57 mm x 38 mm (4" x 2¼" x 1½"). Iberville 1110 Series.

.3 102 mm (4") square or octagonal outlet boxes for lighting fixture outlets.

.4 102 mm (4") square outlet boxes with extension and plaster rings for flush mounting devices in finished tile walls.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 FLOOR BOXES

.1 Flush floor boxes where indicated shall be complete with the following features:

.1 Four (4) independent wiring compartments.

.2 Flexible activation cover.

.3 Fully adjustable.

.4 Sixteen (16) Kos 12.7 mm (½ ") – 32 mm (1 ¼ ").

.5 Stamped steel construction (concrete-tight).

.2 Manufacturers:

.1 Wiremold Cat# RFB4-DTB-2-2T-RAKM11- flush floor box complete with two duplex receptacle brackets, 2 dual RJ brackets, and recessed activation with carpet trim plate.

Approved alternates:

.1 Hubbell Cat. #LCFBSS complete with LCFB XX (colour by architect), flush cover and internal faceplate to suit devices noted on the drawings.

.2 Wellmark Electric Inc. Cat. #400B-1-YY-XX-CRL.

2.6 CONDUIT BOXES

.1 Cast FS or FD feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle **in areas (other than utility rooms) where surface conduit is used.**

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

.1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 mm 50 mm x 63 mm (3" x 2" x 2-1/2") with two double clamps to take non-metallic sheathed cables.

2.8 FITTINGS- GENERAL

.1 Bushing and connectors with nylon insulated throats.

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

.3 Conduit outlet bodies for conduit up to 32 mm (1- 1/4") and pull boxes for larger conduits.

.4 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 (1/4") of opening.

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

.5 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.2 No.65-1956(R1965) Wire Connectors.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as indicated.

.2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Clamps or connectors for armoured cable, and flexible conduit, as required.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

.3 Install fixture type connectors and tighten. Replace insulating cap.

END OF SECTION

Part 1 General

Not Applicable.

Part 2 Products

2.1 MATERIALS

.1 Grounding equipment must conform to CSA C22.2 No 41 (latest edition).

2.2 EQUIPMENT

.1 Insulated grounding conductors: green with insulation type that matches specified phase conductors. Gauge shall be in conformance with the latest edition of the Electrical Safety Code to suit required installation conditions.

.2 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors.
- .4 Bonding jumpers, straps.
- .5 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install connectors in accordance with manufacturer's instructions.

.2 Protect exposed grounding conductors from mechanical injury.

.3 Use mechanical connectors for grounding connections to equipment provided with lugs.

.4 Soldered joints not permitted.

.5 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

3.2 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Transformers, frames of motors, starters, automatic transfer switches, and distribution panels.

3.3 COMMUNICATION SYSTEMS

.1 Install grounding connections for voice/data network systems as follows:

.1 Make grounding system connections to cable management tray and riser conduits..

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Electrical General Requirements Section.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CAN/CSA C22.2 No.18-92, Outlet Boxes, Conduit Boxes, and Fittings.
- .2 CSA C22.2 No.56-1977(R1977), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .3 CSA C22.2 No.83-M1985(R1992), Electrical Metallic Tubing.
- .4 CSA C22.2 No.211.2-M1984(R1992), Rigid PVC (Unplasticized) Conduit.
- .5 CAN/CSA C22.2 No.227.3-M91, Flexible Nonmetallic Tubing.

Part 2 Products

2.1 CONDUITS

.1 Epoxy coated conduit: to CSA C22.2 No.45, with zinc coating and corrosion resistant epoxy finish inside and outside.

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

.3 Rigid PVC conduit: to CSA C22.2 No.211.2.

.4 Flexible metal conduit: to CSA C22.2 No.56, aluminum and liquid-tight flexible metal.

.5 Flexible PVC conduit: to CAN/CSA C22.2 No.227.3, ENT.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 53 mm (2") and smaller. Two hole steel straps for conduits larger than 53 mm (2").

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

.3 Channel type supports for two or more conduits at 1.5 m (5'0") oc.

.4 Threaded rods, 6 mm (1/4") diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 EMT fittings shall be set screw style (zinc alloy).

.2 Flexible metal conduit fittings shall be screw-in type.

.3 Liquid type flexible metal conduit fittings shall be sealtite type.

.4 PVC fittings shall be PVC type complete with PVC adaptors at all boxes.

.5 Coating: same as conduit.

.6 Factory "ells" where 90° bends are required for 27 mm (1") and larger conduits.

.7 Where bushings are noted to be provided they must be “screwed” type fastened to a conduit connector. Push-fit or glued in place bushings will NOT be accepted.

2.4 FISH CORD

.1 Nylon twine.

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/ electrical service rooms and in unfinished areas. Where devices are to be installed on existing walls in finished area, which cannot be "fished", install feeds in a surface metal raceway equal to Wiremold V700 series. Co-ordinate surface installations with consultant prior to rough-in.

.3 Use electrical metallic tubing (EMT) for all branch circuits unless specified otherwise.

.4 Use flexible metal conduit for connection to motors in dry areas, connection to recessed fixtures without a prewired outlet box, connection to surface or recessed fixtures, work in movable metal partitions, and for fishing into existing partitions.

.5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations and for connections to kitchen equipment.

.6 Conduits terminating at electrical equipment in sprinklered areas are to be provided with insulated compression style connectors equal to Thomas & Betts Cat. #TC8XXSC or approved equal.

.7 **Minimum conduit size for branch circuits shall be 21 mm (3/4").** Single drops from ceiling mounted junction boxes down to a light switch or duplex receptacle may be reduced to 16 mm (½").

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

.9 Mechanically bend steel conduit over 27 mm (1") diameter.

.10 Install fish cord in empty conduits.

.11 Run 2- 27 mm (1") spare conduits up to accessible ceiling space from each flush panel. Terminate these conduits in 152 mm x 152 mm x 102 mm (6" x 6" x 4") junction boxes in ceiling space.

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

.13 Dry conduits out before installing wire.

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 (5') clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended or surface channels.

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

.6 Do not locate conduits less than 75 mm (3") parallel to steam or hot water lines with minimum of 25 mm (1") at crossovers.

.7 Do not fasten surface conduit larger than 25 mm (1") to roof deck. Provide standoffs or supports as manufactured by Caddy or use unistrut trapeze fastened to structure.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS

.1 Submit shop drawings for each system in Conformance with The Electrical General Requirements Section.

1.2 PRODUCT/MAINTENANCE DATA

.1 Submit product/maintenance data for each system for inclusion in maintenance manual conforming to The General Electrical Requirements Section.

1.3 SCOPE

.1 The scope of this Section will include the following systems.

- .1 Cable management hangers.
- .2 Telecommunication network system rough-in.
- .3 Occupancy sensors.
- .4 Automatic transfer switch.
- .5 Hand dryers.

Part 2 Products

2.1 CABLE MANAGEMENT HANGERS

.1 Hangers where noted are to be complete with the following features:

- .1 Approximately 100 mm (4”) high by 78 mm (3”) protrusion.
- .2 Constructed from 5 mm (3/16”) x 20 mm (3/4”) flat steel bar and formed to resemble the letter “G”.
- .3 Seven 6 mm (¼”) diameter mounting holes are to be provided around the hanger perimeter.
- .4 Suitable for wall or suspended mounting.
- .5 Acceptable Manufacturers:
  - .1 EMF Cat. #H-433-S
- .6 Manufacturer Contact:

  Electron Metal Fabricators Inc.

  2160 Dagenais Boulevard West

  Laval, Quebec

  H7L 5X9

  Phone: 450-625-8064 or 1-800-267-8064

  Fax: 450-625-8004
- .7 Acceptable Alternates by Wiremold, Mono System, Cablofil.

2.2 TELECOMMUNICATION NETWORK SYSTEM ROUGH-IN

.1 Outlets where noted shall be single gang flush mounted in wall or surface raceways.

.2 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.

.3 Refer to Telecommunication Network Installations section for additional Telecommunication network installation requirements.

2.3 OCCUPANCY SENSORS

.1 Where noted on drawings the wall mounted (passive technology) occupancy sensor used in storage and service rooms shall be either:

.1 Wattstopper Cat. #PW-100-VOLT-X (colour by Architect).

.2 Sensor switch Cat. #WSD-VOLT-X (colour by Architect).

.3 Equal by Eaton Controls.

.2 Where noted on the drawings, the wall mounted switch style occupancy sensor used in Administrative Offices and Seminar/Meeting Rooms shall be a dual technology switch with either single or double relay (circuit) as noted on the drawings. Colour to suit architect.

Note: For dual relay switches, program the sensor for 15 minute off delay, enabled walk-thru, audible alert enabled, relay 1 on mode: auto on, relay 2 on mode: manual on.

.1 Single relay (circuit): Wattstopper Cat. #DW-100

.2 Dual relay (circuit): Wattstopper Cat. #DW-200

.3 Approved equal:

.1 Eaton.

.2 Sensor switch.

.3 Provide other occupancy sensors to suit the detail on the drawings.

.4 All sensors shall be set to 5 minutes “delay to off” unless otherwise directed.

2.4 AUTOMATIC TRANSFER SWITCH

.1 Furnish and install automatic transfer switch (ATS) system utilizing 3 pole, solid neutral, with amperage, voltage, withstand and close-on ratings as shown on the plans. Each automatic transfer shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. All automatic transfer switches and controllers shall be the products of the same manufacturer.

.2 The automatic transfer switches and controls shall conform to the requirements of:

.1 UL 1008 - Standard for Transfer Switch Equipment

.2 IEC 947-6-1 Low-voltage Switchgear and Controlgear; Multifunction equipment; Automatic Transfer Switching Equipment

.3 IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

.4 NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches

.5 CSA C22.2 No. 178 (latest edition)

.6 Latest edition of the Electrical Safety Code.

.3 Automatic transfer switches shall be equal to ASLO CAT #D03ATSA30030RG0C.

2.5 HAND DRYERS

.1 Hand dryers where noted on the drawings are to be supplied and installed by this Division with the following features:

.1 Surface mounting.

.2 Fixed nozzle.

.3 White finish with automatic activation.

.4 Rating of 1800 W (20 A) at 120 V.

.5 NOVA 4-0412

.6 Approved alternate:

.1 World Dryer Cat. #XA5-2-974.

Part 3 Execution

3.1 CABLE MANAGEMENT HANGERS

.1 Install hangers as per details in configuration noted.

.2 Prior to installation co-ordinate location with other services within the ceiling space.

.3 Co-ordinate with noted sub-contractors to install cables noted to be utilizing these hangers. Cables are to be installed such that the maximum sag between hangers does not exceed 25 mm (1"). This electrical contractor is to coordinate.

3.2 TELECOMMUNICATION NETWORK SYSTEM ROUGH-IN

.1 Install rider and zone conduits as noted.

.2 Conduits terminated into ceiling spaces must be within 3m (10') of zone conduits (if applicable).

.3 Ensure specified zone conduits are installed back to service backboard.

.4 Outlets are to be installed complete with 21 mm ($^{3}/_{4}$") conduit to corridor ceiling space or nearest zone conduit (if applicable).

.5 Provide insulated bushings on all conduits terminated in ceiling space.

.6 Refer to Telecommunication Network Installations Section for additional Telecommunication network installation requirements.

3.3 OCCUPANCY SENSORS

.1 Install power packs in accessible maintenance areas.

.2 Provide access doors if power packs are installed above drywall ceilings.

.3 It shall be the contractor's responsibility to locate and aim sensory in the correct location required for complete and proper coverage within the range of coverage as per the manufacturer's recommendations. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective rooms.

.4 It is the contractor's responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the facility, to verify placement to sensors and installation criteria.

.5 The contractor shall also provide the on-site training necessary to familiarize the owner's personnel with the operation, use, adjustment and problem solving diagnosis of the occupancy sensing devices systems.

.6 Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor placement to ensure a trouble-free occupancy-based lighting control. Submit commissioning report with closeout documents.

3.4 AUTOMATIC TRANSFER SWITCH

.1 Contractor shall perform on site acceptance test. Provide test certificate upon completion.

.2 The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified a minimum of 7 days in advance and shall have the option to witness the tests.

.3 Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system. Coordinate timing and obtain approval for start of test with site personnel.

3.5 HAND DRYERS

.1 Install and connect hand dryers in conformance with manufacturer's recommendations.

.2 Hand dryers are to be mounted at a height to suit age of expected users'. Unless otherwise noted confirm height with manufacturer, owner, Architect, and/or consultant prior to rough in.

.3 Once installed this contractor is to caulk the joint between dryer and wall surface with a bead of white silicone.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Dry type transformers must conform to CSA C22.2 No.47 and C9 (latest edition).

.2 **Dry type transformers must conform to CSA C802 (latest edition).**

.3 Dry type transformers must be in accordance with Ontario Green Energy Act 2018 (NRCan 2018) DOE 2016.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 TRANSFORMERS

.1 Transformers to be of one manufacturer throughout project.

.2 Ratings and characteristics shall be as indicated on riser diagrams.

.3 Aluminum winding.

.4 Transformers are to be ventilated dry type style with 4-2½% taps (2 F.C.B.N. and 2 F.C.A.N.)

.5 Maximum permissible sound levels shall be as follows:

Transformer Rating (KVA)	Sound Level (dBA)
≤50	45
51 to 150	50
151 to 300	55
301 to 500	60

.6 All transformers with a K factor of a 3 or above must be electro-static shielded.

.7 Transformers with a K-factor of 3 or above must include a secondary neutral bus that is sized at twice the rated secondary phase current.

.8 Transformer enclosure shall be EEMAC 2 complete with removable front panel.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Electrical General Requirements Section.

.2 Label must indicate:

.1 transformer "tag" as per riser diagram

.2 primary and secondary voltage and phase.

2.3 ACCEPTABLE MANUFACTURERS:

.1 Acceptable manufacturers are as follows:

.1 Hammond

.2 Rex

.3 Delta

.4 Acme

.5 Bemag

.6 GE Industrial QL Series

Part 3 Execution

3.1 INSTALLATION

.1 Primary and secondary feeders are to be connected using flexible conduit.

.2 Transformers with a rating up to and including 75 KVA are permitted to be wall mounted provided mounting method is a suitably sized angle iron frame secured to structure (i.e. masonry wall, steel columns, etc. NOT metal siding).

.3 The above rating of transformers may also be suspended from **structure only** on a unistrut trapeze as detailed.

.4 Transformers above 75 KVA must be floor mounted.

.5 Floor mounted transformers are to be mounted/secured to a concrete pad suitably sized to suit the transformer. This pad is the responsibility of this contractor and must be provided in conformance with the standard of Division 1 specifications for poured in place concrete.

.6 All transformers must be mounted on vibration isolators equal to Korfund RD2-grey or approved equal.

.7 Ensure adequate clearance around transformer for ventilation as per the Electrical Safety Code.

.8 Install transformers in level upright position.

.9 Remove shipping supports only after transformer is installed and just before putting into service.

.10 Loosen isolation pad bolts until no compression is visible.

.11 Make primary and secondary connections in accordance with wiring diagram.

.12 Energize transformers after installation is complete.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with Electrical General Requirements Section.

.2 Drawings to include electrical detail of panel, branch breaker or switch type, quantity, ampacity and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

.1 Panel boards must conform to CSA C22.2 No. 29 (latest edition).

.2 Panelboards: product of one manufacturer.

.3 Install circuit breakers in panelboards before shipment.

.4 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand. **Series rating is acceptable – submit information with shop drawings.**

.5 Bus and breakers must be rated for [10,000] A (symmetrical) interrupting capacity or as indicated.

.6 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.7 Panelboard mains, number of circuits, and number and size of branch circuit breakers as indicated.

.8 Two keys for each panelboard and key panelboards alike.

.9 Aluminum bus with neutral of same ampere rating as mains.

.10 Mains must be suitable for bolt-on breakers. Provide main (if applicable) and branch breakers as bolt-on style.

.11 Trim with concealed front bolts and hinges.

.12 Trim and door finish must be baked grey enamel.

.13 All panels regardless of voltage and amperage must be provided with a lockable door.

.14 Branch circuit panelboards (250 AMP or smaller) must be one of the following:

- .1 Cutler Hammer CAT. # POW-R-LINE-C PRL-1 or PRL-2,
- .2 Schneider Electric CAT# NQ Series
- .3 Siemens CAT #Sentron P1 Series
- .4 GE Industrial Cat. # AQ Series (120/208V)
  AD Series (347/600V)

2.2 BREAKERS

.1 Breakers: to Moulded Case Circuit Breakers Section.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker (if specified) must be separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for fire alarm, stairway, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Electrical General Requirements Section.

.2 Nameplate for each panelboard size 4 engraved description as indicated. In finished areas install label on inside of panel, and in service areas install label on exterior of panel.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved “name of load” as indicated.

.4 Complete circuit directory with typewritten legend showing location of each circuit. **Include a copy of the directories in the maintenance manuals.**

Part 3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Electrical General Requirements Section or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded case circuit breakers must conform to CSA C22.1 No.5.1-M91 (latest edition.)

.2 Bolt-on moulded case circuit breaker quick-make, quick-break type, for manual and automatic operation.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Unless otherwise indicated moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated complete with all necessary mounting hardware and filler panels if necessary.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 SWITCHES

.1 General purpose AC switches must conform to CSA C22.2 No. 111 (latest edition).

.2 15 or 20 A, 120 V, single pole, double pole, three-way, four-way, keyed, or motor rated switches complete with pilot light.

.3 Manually-operated general purpose ac switches with following features:

- .1 Terminal holes approved for No. 10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine molding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 Toggle style (Rocker style) (architect to select colour).

.4 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.5 Switches of one manufacturer throughout project.

.6 Acceptable materials:

single pole: Hubbell Cat # HBL1201 Series

three way: Hubbell Cat # HBL1203 Series

four way: Hubbell Cat # HBL1204 Series

Keyed: Hubbell Cat. #HBL1221 Series complete with 2 keys per switch

(Keys): Hubbell Cat. #HBL1209

Motor rated: Hubbell Cat. #HBL1221PL c/w pilot light (20 A):

.7 Acceptable alternate manufacturers include:

- .1 Pass & Seymour
- .2 Leviton.

2.2 RECEPTACLES

.1 Receptacles, plugs, and other similar wiring devices must conform to CSA 22.2 No 42 (latest edition).

.2 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features (20A where noted):

.1 Urea molded housing (Colour by architect).

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

.5 Acceptable materials:

Standard duplex receptacle	Hubbell Cat # HBL5252CN
Ground fault protected T-slot receptacles	Hubbell Cat. # GF20L A complete with Decora style coverplate to suit specification below

.6 Acceptable alternate manufacturers include:

.1 Pass & Seymour

.2 Leviton

.7 Receptacles connected to generator backed circuits shall be grey in colour.

2.3 COVER PLATES

.1 Cover plates from one manufacturer throughout project.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Stainless steel, brushed, 1 mm (1/32") thick cover plates for wiring devices mounted in flush-mounted outlet box.

.4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof cover plates complete with gaskets and “heavy-duty in use” covers in conformance with the Electrical Safety Authority. Provide product equal to Intermatic Cat. #WP5100C.

Part 3 Execution

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height specified in Electrical General Requirements Section or as indicated.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height specified in Electrical General Requirements Section or as indicated.

.3 Where split receptacle has one portion switched mount vertically and switch upper portion.

.3 Cover plates:

.1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No.248.12/94, Low Voltage Fuses Part 12: Class R (Bi-National Standard with, UL 248-12 (1st Edition).

.2 CSA C22.2 No. 106-M92 (latest edition).

1.2 MAINTENANCE MATERIAL

.1 Three spare fuses of each type and size installed.

1.3 DELIVERY AND STORAGE

.1 Ship fuses in original containers.

.2 Store fuses in original containers in moisture free location.

Part 2 Products

2.1 FUSES GENERAL

.1 Fuses: product of one manufacturer for entire project .

.2 Fuses specified below must conform to CSA C22.2 No. 106 (latest edition). Fuses conforming to standard C22.2 No. 106-1953 will be rejected.

.3 Fuses must provide a fully co-ordinated system for both overload and fault conditions.

2.2 FUSE TYPES

.1 Class J fuses (formerly HRCI- J).

.1 Time delay, capable of carrying 500% of its rated current for 10 s minimum.

.2 Fast acting as noted.

.2 Class R fuses (formerly HRCI- R). For UL Class RK1 fuses, peak let-through current and I^2t values not to exceed limits of UL 198E-1982, table 10.2.

2.3 ACCEPTABLE PRODUCTS

.1 Motor Protection:

1-600 A: Mersen Type AJT

.2 Other acceptable manufacturers:

.1 GEC

.2 Little Fuse

Part 3 Execution

3.1 INSTALLATION

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.

.1 Install Class R rejection clips for HRCI-R fuses.

.3 Ensure correct fuses fitted to assigned electrical circuit.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Enclosed manual air break switches must conform to CSA C22.1 No.4 (latest edition).

.2 Fuseholder assemblies must conform to CSA C22.2 No.39 (latest edition).

.3 Fusible, and/or non-fusible, horsepower rated disconnect switches, size as indicated.

.4 Provision for padlocking in off switch position by three locks.

.5 Mechanically interlocked door to prevent opening when handle in ON position.

.6 Fuses: size as indicated, to Fuses - Low Voltage Section.

.7 Fuseholders: relocatable and suitable without adaptors, for type and size of fuse indicated.

.8 Quick-make, quick-break action.

.9 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Electrical General Requirements Section.

.2 Indicate name of load controlled on size 4 nameplate.

2.3 ACCEPTABLE MANUFACTURERS

Manufacturer	General Purpose	Weather Proof
Cutler Hammer	IHD Series	3HD Series
Schneider Electric	Type A Series	Type R Series
Siemens	ID Series	NFR/FR Series
GE Industrial	TH Series	TH Series

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with Electrical General Requirements Section.

.2 Indicate:

.1 Mounting method and dimensions.

.2 Starter/contactor size and type.

.3 Layout of identified internal and front panel components.

.4 Enclosure types.

.5 Wiring diagram for each type of starter.

.6 Interconnection diagrams.

1.2 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into manual specified in Electrical General Requirements Section.

.2 Include operation and maintenance data for each type and style of starter/contactor.

1.3 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Electrical General Requirements Section.

.2 Provide listed spare parts for each different size and type of starter:

.1 1 operating coil.

.2 3 fuses.

.3 10% indicating lamp bulbs used.

Part 2 Products

2.1 MATERIALS

.1 Starters: must conform to CSAC22.2

No. 14 (latest edition) and EEMAC E14-1.

.2 Control transformers must conform to

CSAC22.2 No. 66 (latest edition).

.3 Auto-transformers must conform to CSAC22.2 No 47 (latest edition).

.4 Contactors must conform to CSA C22.2 No. 14 (latest edition).

.5 Half size and IEC starters will not be accepted.

2.2 MANUAL MOTOR STARTERS

.1 Single and Three phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:

.1 Switching mechanism, quick make and break.

.2 One or Three overload heaters, manual reset, trip indicating handle.

.3 Toggle switch: standard duty labeled “on”/”off”.

.4 Indicating light: standard duty type and red colour.

.5 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type.

.2 Motor overload protective device in each phase, manually reset from outside enclosure.

.3 Wiring and schematic diagram inside starter enclosure in visible location.

.4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include fused disconnect switch with operating lever on outside of enclosure to control disconnect, and provision for:

.1 Locking in "OFF" position with up to 3 padlocks.

.2 Independent locking of enclosure door.

.3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:

.1 Pushbuttons Selector switches standard duty labeled as indicated.

.2 Indicating lights: standard duty type and color as indicated.

.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

.4 1 red pilot light for “stop” or “off” and 1 green light for “start” or “on”.

2.4 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and secondary voltage to suit remote control device, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

2.5 CONTACTORS

.1 Electrically held and controlled by pilot devices as indicated and rated for type of load controlled.

.2 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.

.3 Mount in CSA Enclosure 1 unless otherwise indicated.

.4 Include following options in cover:

.1 Red indicating lamp.

.2 Hand - Off - Auto selector switch.

.5 Control transformer: mounted in contactor enclosure.

.6 Contactors must be definite purpose.

2.6 FINISHES

.1 Apply finishes to enclosure in accordance with Electrical General Requirements Section.

2.7 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Electrical General Requirements Section.

.2 Manual starter designation label: black plate, white letters, size 1, engraved as indicated.

.3 Magnetic starter designation label: black plate, white letters, size 2, engraved as indicated.

.4 Contactor designation label:

black plate, white letters, size 4, indicating name of load controlled.

2.8 ACCEPTABLE MANUFACTURERS

.1 The acceptable manufacturers are as follows:

.1 Allen Bradley

.2 Cutler Hammer

.3 Siemens

.4 Group Schneider

.5 Klockner Moeller

Part 3 Execution

3.1 INSTALLATION

.1 Install starters, connect power and control as indicated.

.2 Ensure correct fuses and overload devices elements installed.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Electrical General Requirements Section.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

.5 Install contactors and connect auxiliary control devices.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41- 1991, Recommended Practices for Surge Voltages in Low-Voltage AC Power Circuits.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM F1137- 88 (1993), Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.3 United States of America, Federal Communications Commission (FCC)

.1 FCC (CFR47) EM and RF Interference Suppression.

.4 IESNA LM-79-08, IES Electrical Method for the Electrical and Photometric Measurements of Solid State Lighting Products.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with Electrical General Requirements Section for all light fixtures supplied under this contract.

.2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Consultant.

.3 Photometric data to include: VCP Table spacing criterion.

1.3 SCOPE

.1 This contractor is responsible to supply and install all lighting fixtures as scheduled and/or indicated including lamp and those accessories required for a complete lighting system. This contractor must coordinate lighting installations with all other Divisions of this project.

.2 All fixtures must be CSA approved or approved at this contractor's expense by the Special Inspection Division of the Electrical Safety Authority.

1.4 GUARANTEE

.1 Guarantees shall be as follows from date of substantial completion.

.1 LED fixtures, and driver: 5 years.

.2 The labour required to replace these drivers must be included in the above guarantee.

Part 2 Products

2.1 FIXTURE CONSTRUCTION

.1 Fixtures must be constructed of 20 gauge (minimum) cold rolled steel. All metal edges require smooth finish.

.2 Light leaks must be prevented by providing gasketting, stops, and barriers.

.3 Fixtures must be finished in high reflective baked white enamel. This surface must have a reflectance of not less than 85%.

2.2 FIXTURE LENS

.1 Unless otherwise noted fixture lenses shall be as follows:

.1 Lens thickness: 3.2 mm (1/8")

.2 Material: injection moulded clear prismatic virgin acrylic

.3 Frame: hinged, latched, steel.

2.3 LED FIXTURES

.1 Fixture LED's must be tested in conformance with IESNA LM80 standard.

.2 LED's must be selected using a binning algorithm to ensure colour and lumen output of a given fixture are consistent, as well as meet or surpass ANSI C78.377 specification for the rated lifetime of the fixture. Colour accuracy between products must be within a 2-step MacAdam ellipse.

.3 Luminaires must be tested to IESNA LM79 by an independent approved laboratory.

.4 Luminaires must be tested prior to shipping.

.5 Luminaires must be ULC certified and approved for use in Canada.

.6 Fixtures must maintain a minimum of 90% of their initial light output for 60,000 hours. Submit test results upon request.

.7 Lumen values indicated for fixtures in the project documents are to be considered as "absolute" or "delivered" values.

.8 Other than for specialty fixtures, and unless otherwise indicated, the maximum driver current is to be 750 mA.

.1 Test switch.

2.4 EMERGENCY LIGHTING UNITS

.1 Emergency lighting units must conform to CSA C22.2 No 141 (latest edition).

.2 Supply voltage: as noted on drawings.

.3 Output voltage: 12 V DC.

.4 Battery: sealed, maintenance free, 10 year life.

Note: Battery units must be capable of supplying the wattage indicated for a minimum of 30 minutes.

.5 Charger: solid state, multi rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.

.6 Solid state transfer circuit.

.7 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.8 Signal lights: “AC Power ON” condition and “charging” condition.

.9 Lamp heads: integral on unit, 345º horizontal and 180º vertical adjustment. Lamp type: minimum 4 watt LED.

.10 Cabinet suitable for direct of shelf mounting to wall and complete with knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.11 Auxiliary equipment:

.1 Test switch.

.2 Ac input and DC output terminal blocks inside cabinet.

.3 Shelf.

.4 Cord and plug connection for AC.

2.5 REMOTE EMERGENCY LIGHTING FIXTURES

.1 Remote emergency lighting fixtures must conform to CSA C22.2 No141 (latest edition).

.2 Fixtures shall be small “micro” size or recessed style as indicated in the Light Fixture Schedule.

.3 Fixtures must be adjustable type heads with canopy.

.4 Fixtures are to be provided with protective lexan cube when specified in the Light Fixture Schedule.

.5 Unless otherwise indicated surface mounted fixtures in washrooms, locker rooms, changerooms, and gymnasiums must be provided with wire guard.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated. Luminaires are not to be supported from the roof deck. Provide additional unistrut support channel and/or support from structure. Co-ordinate with consultant on site.

.2 Ball align hangers must be provided for rod suspended fixtures.

.3 Fixtures surface mounted to suspended ceilings must be secured through ceiling assembly to cross member supports. These supports are to be steel channels or angles independently secured **to structure** using # 12 “jack” chain. Each chain must be secured so no fixture weight is added to the ceiling assembly.

.4 Plaster frames/flange kits must be provided by this Division for fixtures recessed in plaster and/or drywall ceilings.

.5 Where specified, fixtures to be chain hung shall be hung using “jack” chain with a capacity to suit the fixture weight. Branch circuit wiring feeding these fixtures shall be AC90 cable “ty-wrapped” at 900mm (36") intervals along length of drop. Final appearance must be neat and professional.

.6 Install emergency lighting units and associated remote mounted fixtures as indicated.

.7 Direct “heads” on units and remote mounted fixtures to illuminate path(s) of exit.

.8 Install emergency lighting units and remote fixtures at 300mm (12") below finished ceiling, unless indicated otherwise.

.9 Provide a 15 A 120 V duplex receptacle (connected to circuit indicated) adjacent to unit. **This receptacle connection is to be no lower than 8' 0" (2400 mm) AFF.**

.10 Special installation: Secure fixtures to structure to conform to the Electrical Safety Code using "jack chain" NOT ceiling suspension wire. Where coreslab is used, suspension point must be independent of the one used for suspension of the ceiling assembly. As an alternate to jack chain the contractor may use a pre-manufactured aircraft cable suspension and fastening system as manufactured by Gripple (Gripple Cat. #HF02-10F2). Provide minimum 2 per fixture.

.11 All battery units are to be provided with a visible lamicoid label indicating the unit number as per drawings.

3.2 WIRING

.1 Connect luminaires to lighting circuits as indicated.

.2 Connect unit equipment to circuits as indicated.

.3 All wiring of remote emergency fixtures shall be minimum #10 T90 for each circuit and run in conduit. Wiring must be sized in conformance with manufacturer's recommendations for distances required.

3.3 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.4 DELIVERIES

.1 Fixtures are to be completely assembled at the manufacturer's plant and delivered to the project site in original unitized containers. Ensure that a dry, protected and secure space is available for proper storage before scheduling delivery of fixtures.

3.5 TESTING/CERTIFICATION

.1 At the completion of the project and in the presence of the consultant, test all exit and emergency fixtures. On company letterhead, the contractor is to prepare a chart indicating:

.1 project
.2 date
.3 equipment type
.4 certification of correct connection
.5 certification of correct operation
.6 duration of test in minutes (minimum 30)
.7 actual period of testing (time of day)

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE).

.2 Underwriter Laboratories of Canada (ULC).

.3 International Electrotechnical Commission.

.4 International Organization for Standardization (ISO).

.5 National Electrical Manufacturers Association (NEMA).

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with Section 26 01 16.

.2 Submit composite wiring diagrams and control schedule for each room control circuit type as proposed to be installed. Include load type, sequence of operation, sensor parameters, time delays, sensitivities and daylighting set points.

.3 Catalog cut sheets with performance specifications demonstrating compliance with specified requirements.

1.3 SCOPE

.1 This contractor is responsible to supply and install all equipment and control wiring as specified for the digital occupancy and daylight control systems. This contractor must coordinate these control systems with the lighting fixtures being supplied for the project to ensure intended function as specified.

.2 Control Intent: Control Intent includes, but is not limited to:

.1 Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.

.2 Initial sensor and switching zones

.3 All equipment must be CSA approved or approved at this contractor's expense by the Special Inspection Division of the Electrical Safety Authority.

.4 Reference section 26 51 13 for Lighting information.

.5 Reference section 26 05 75 for line voltage occupancy sensors and switches (hard wired analog).

1.4 SYSTEM DESCRIPTION AND OPERATION

.1 The Digital Lighting Control (room level) as defined under this section covers the following equipment:

.1 Digital Room Controllers – Self-configuring, digitally addressable one, two or three relays controllers.

.2 Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.

.3 Digital Switches – Self-configuring, digitally addressable pushbutton switches, dimmers, and scene switches with two-way active infrared (IR) communications.

.4 Digital Photosensors – Single-zone closed loop sensors with two-way active infrared (IR) communications can provide switching or dimming control for daylight harvesting.

.5 Configuration Tools – Handheld remote for room configuration provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from an accessible location.

1.5 LIGHTING CONTROL APPLICATIONS

.1 Provide a minimum application of intended lighting control functions as detailed on design drawings and specified herein. Control functions shall include the following:

.1 Space Control Requirements – Provide occupancy/vacancy sensors with Manual-ON functionality in all spaces except toilet rooms, storerooms, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors.

.2 Bi-Level Lighting – Provide single zone, multi-level controls in any enclosed office, conference room, meeting room, and training room in all enclosed spaces except where variable dimming or multi-zone switching is used.

.3 Daylit Areas – All luminaries closest to the daylight source, and zoned separately from other fixtures in the space, shall be controlled separately from luminaires outside of daylit zones. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings.

1.6 WARRANTY

.1 Provide a five year complete manufacturer's warranty on all products to be free of manufacturers' defects.

1.7 QUALITY ASSURANCE

.1 Manufacturer: Minimum 10years experience in manufacture of lighting controls.

Part 2 Products

2.1 MANUFACTURERS

.1 Basis of design product: WattStopper Digital Lighting Management (DLM). Acceptable alternates are subject to compliance and prior approval with specified requirements of this section, as one of the following:

.1 Eaton Controls (Greengate).

.2 Acuity Controls (nlight).

.2 Substitutions:

.1 All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 7 working days prior to the bid date and must be made available to all bidders.

.2 By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.

2.2 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM

.1 Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the Company's system which accommodates the square-foot coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors and accessories which suit the lighting and electrical system parameters.

.2 Digital Occupancy Sensors shall provide calibration and electronic documentation for the following features:

.1 Digital calibration and pushbutton programming for the following variables:

.1 Sensitivity – 0-100% in 10% increments

.2 Time delay – 1-30 minutes in 1 minute increments

.3 Test mode – Five second time delay

.4 Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.

.5 Walk-through mode

.6 Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.

.2 Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.

.3 Device Status LEDs including:

.1 PIR Detection

.2 Ultrasonic detection

.3 Configuration mode

.4 Load binding

.4 Manual override of controlled loads.

.5 One or two RJ-45 port(s) for connection to DLM local network.

.3 Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

WattStopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC

2.3 DIGITAL WALL SWITCHES

.1 Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration; colour per architect, compatible with wall plates with decorator opening. Wall switches shall include the following features:

.1 Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

.2 Removable buttons for field replacement with engraved buttors and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.

.2 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

.3 The following switch attributes may be changed or selected using a wireless configuration tool:

.1 Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).

.2 Individual button function may be configured to Toggle, On only or Off only.

.3 Individual scenes may be locked to prevent unauthorized change.

.4 Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

.4 Two RJ-45 ports for connection to DLM local network.

.5 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

.6 WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101.

2.4 DIGITAL POWER PACKS (ROOM CONTROLLERS)

.1 Room Controllers automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room Controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will not have, dip switches, potentiometers or require special configuration. The control units will include the following features:

.1 Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.

.2 Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.

.3 Device Status LEDs to indicate:
  .1 Data transmission
  .2 Device has power
  .3 Status for each load
  .4 Configuration status
.4 Quick installation features including:
  .1 Standard junction box mounting
.5 Plenum rated
.6 Manual override and LED indication for each load
.7 120 VAC, 60 Hz operation.
.8 Zero cross circuitry for each load.

.2 On/Off Room Controllers shall include:
  .1 One or multiple relay configuration to suit control details
  .2 Efficient 150 mA switching power supply
  .3 Sufficient sensor connection points to suit indicated function without the requirement for additional hardware
  .4 Discrete model listed for connection to receptacles, for schedule-based control of plug loads within the space.
    .1 One relay configuration only.
    .2 Automatic-ON/OFF configuration.
    .3 Optional Network Bridge for BACnet MS/TP communications
  .5 Three RJ-45 DLM local network ports.
  .6 WattStopper product numbers: LMRC-101, LMRC-102, LMPL-101, LMPL-201.

.3 On/Off Room/Dimming enhanced Room Controllers shall include:
  .1 One or multiple relay configuration to suit control details.
  .2 Efficient 250 mA switching power supply.
  .3 One 0-10 volt analog output per relay for control of compatible ballasts and LED drivers.
  .4 The following dimming attributes may be changed or selected using a wireless configuration tool:
    .1 Establish preset level for each load from 0-100%.
    .2 Set high and low trim for each load.
    .3 Set lamp burn in time for each load up to 100 hours.
  .5 Four RJ-45 DLM local network ports.
  .6 Optional Network Bridge for BACnet MS/TP communications.
  .7 WattStopper product numbers: LMRC-211, LRMC-212, LRMC-213, LMPL-201, LMRC-311, LMRC-312, LMRC-313.

2.5 DIGITAL PHOTO SENSORS

.1 Digital photosensors work with room controllers to provide automatic switching or dimming daylight harvesting capabilities for any load type connected to a room controller. Closed loop photosensors measure the ambient light in the space and control a single lighting zone.

.2 Digital photosensors include the following features:

.1 An internal photodiode that measures only within the visible spectrum, and has a response curve that closely matches the photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers.

.2 Sensor light level range shall be from 1-10,000 footcandles (fc).

.3 The capability of switching one-third, one-half or all lighting ON and OFF, or raising or lowering lighting levels, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).

.4 For switching daylight harvesting, the photosensor shall provide a deadband or a separation between the “ON Setpoint” and the “OFF Setpoint” that will prevent the lights from cycling after they turn off.

.5 For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a user-selectable minimum level.

.6 Optional programmable wall switch override to allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise and lower lighting levels for a selected period of time or cycle of occupancy.

.7 Infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.

.8 Configuration LED that blinks to indicate data transmission

.9 Status LED indicates test mode, override mode and load binding.

.10 Recessed switch to turn controlled load(s) ON and OFF.

.11 One RJ-45 port for connection to DLM local network.

.12 An adjustable head and a mounting bracket to accommodate multiple mounting methods and building materials. The photosensor may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox.

.3 Closed loop digital photosensors include the following additional features:

.1 An internal photodiode that measures light in a 100 degree angle, cutting off the unwanted light from bright sources outside of this cone.

.2 Automatic self-calibration, initiated from the photosensor, or a wireless configuration tool.

.3 Automatically establishes setpoints following self-calibration.

.4 A sliding setpoint control algorithm for dimming daylight harvesting with a “Day Setpoint” and the “Night Setpoint” to prevent the lights from cycling.

.5 WattStopper Product Number: LMLS-400.

2.6 DIGITAL ROOM CONTROL SYSTEMS

.1 Digital occupancy and daylight control system designed to control a small area of a building (room level). Digital devices connect to the room controller(s) using CAT 5e cables (LMRJ) with RJ-45 connectors which provide both data and power to room devices. Features of the system shall include:

.1 Plug n’ Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.

.2 Simple replacement of any device in the system with a standard off the shelf unit without requiring commissioning, configuration or setup.

.3 Push n’ Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices which are part of the local system.

.4 Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

2.7 CONFIGURATIONS TOOLS

.1 A configuration tool facilitates optional customization of digital lighting control system featuring infrared communications.

.2 Features and functionality of the wireless configuration tool shall include:

.1 Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.

.2 Read, modify and send parameters for occupancy sensors, daylighting sensors, room controllers and buttons on digital wall switches.

.3 Save up to nine occupancy sensor setting profiles, and apply profiles to selected sensors.

.3 WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

2.1 PROGRAMMING, CONFIGURATION AND DOCUMENTATION SOFTWARE

.1 PC-native application for optional programming of detailed technician-level parameter information for all DLM products, including all parameters not accessible via BACnet and the handled IR configuration tool. Software must be capable of accessing room-level parameter information locally within the room when connected via the optional LMCI-100 USB programming adapter, or globally for many segment networks simultaneously utilizing standard BACnet/IP communication.

.2 Additional parameters exposed through this method include but are not limited to:

.1 Occupancy sensor detection LED disable for performance and other aesthetic spaces where blinking LEDs present a distraction.

.2 Six occupancy sensor action behaviors for each controlled load, separately configurable for normal hours and after hours modes. Modes include: No Action, Follow Off Only, Follow On Only, Follow On and Off, Follow On Only with Override Time Delay, Follow Off Only with Blink Warn Grace Time, Follow On and Off with Blink Warn Grace Time.

.3 Separate fade time adjustments per load for both normal and after hours from 0 - 4 hours.

.4 Configurable occupancy sensor re-trigger grace period from 0 - 4 minutes separate for both normal hours and after hours.

.5 Separate normal hours and after hours per-load button mode with modes including: Do nothing, on only, off only, on and off.

.6 Load control polarity reversal so that on events turn loads off and vice versa.

.7 Per-load DR (demand response) shed level in units of percent.

.8 Load output pulse mode in increments of 1second.

.9 Fade trip point for each load for normal hours and after hours that establishes the dimmer command level at which a switched load closes its relay to allow for staggered On of switched loads in response to a dimmer.

.3 Generation of reports at the whole file, partial file, or room level. Reports include but are not limited to:

.1 Device list report: All devices in a project listed by type.

.2 Load binding report: All load controller bindings showing interaction with sensors, switches, and daylighting.

.3 Room summary report: Device manifest for each room, aggregated by common BOM, showing basic sequence of operations.

.4 Device parameter report: Per-room lists of all configured parameters accessible via hand held IR programmer for use with O&M documentation.

.5 Scene report: All project scene pattern values not left at defaults (i.e. 1 = all loads 100 percent, 2 = all loads 75 percent, 3 = all loads 50 percent, 4 = all loads 25 percent, 5-16 = same as scene 1).

.6 Occupancy sensor report: Basic settings including time delay and sensitivities for all occupancy sensors.

Part 3 Execution

3.1 INSTALLATION

.1 Install the work of this Section in accordance with manufacturer’s printed instructions unless otherwise indicated.

.2 When using wire for connections other than the DLM local network (LMRJ Cat 5e with RJ-45 connectors), provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contactor termination requirements.

.3 Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.

.1 Adjust time delay so that controlled area remains lighted for 5 minutes after occupant leaves area.

.4 Install power packs in accessible maintenance areas unless noted otherwise. Provide access doors if power packs are installed above drywall ceilings.

.5 It shall be the contractor's responsibility to locate and aim sensory in the correct location required for complete and proper coverage within the range of coverage as per the manufacturer's recommendations. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective rooms.

.6 Provide written or computer-generated documentation on the commissioning of the system including room by room description including:

.1 Sensor parameters, time delays, sensitivities, and daylighting setpoints.

.2 Sequence of operation, (e.g. manual ON, Auto OFF. etc.)

.3 Load Parameters (e.g. blink warning, etc.)

.7 Re-commissioning – After 30 days from occupancy re-calibrate all sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

3.2 FACTORY COMMISSIONING

.1 Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

.2 The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the system startup and adjustment date.

.3 Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

.4 Factory commissioning shall include functional testing and documentation of the control system conforming to the "Functional Testing" requirements included in the current ASHRAE standard. This cost shall be included in the Tender Price.

END OF SECTION

Part 1 GENERAL CABLING STANDARDS

1.1 GENERAL SCOPE OF WORK

.1 This document describes the requirements for furnishing and installing a certified telecommunications horizontal cabling, copper and fiber backbone infrastructure for Durham College. The client will be installing a ***VoIP system*** at this location. A balanced plenum Cat6 utp twisted-pair cabling system capable of supporting a minimum **250MHz** of bandwidth as described in this document.

.2 The cabling system shall provide data cables from each of the telecommunications outlet/connector (TO) in each work area (WA) back to the LAN Room (TR) location in the basement. All runs will terminate in LAN room. No permanent link shall exceed 90 m (295 ft), as measured from the cable termination point at each end. An additional 10 m (33 ft) is allowed for cordage at both ends, for a maximum allowable end-to-end or channel length of 100 m (328 ft). ***See drawing for exact quantities and locations***.

.3 Supply and install one 19" 4 post data rack with two (2) vertical wire managers in the LAN room.

.4 Cable to be terminated on BIX type hardware in the electrical room and on GigaBIX hardware in the LAN room location.

.5 Fibre to be terminated in a patch panel in the LAN room.

.6 Fibre between the data center location and the existing LAN room in the DC campus building. Cable to be terminated in a fibre patch panel in the LAN Room and in a rack mount fiber patch panel in the data center location. Refer to note 13.

.7 Supply and install 12" x 4" overhead basket cable tray within the LAN room to support the Cat6 pigtail cables to the backboard (refer to drawing for info).

.8 Supply and install one Cat6 pigtails for each data cable that is indicated on the drawing from the data rack via overhead basket cable tray to the furred out backboard and terminate on GigaBIX type hardware. Cat6 pigtails are to be installed in the clients network switches (size of switches to be determined). (round up to the nearest 24 or 48 switch port count)

.9 Contractor to cross connect (all pairs) and provide an excel spread sheet listing the switch name, port and cable ID.

.10 All cables and related support, termination, and grounding hardware shall be furnished, configured, installed, tested, labeled, and documented by the successful bidder as detailed in this document.

.11 The Electrical Contractor is responsible for providing pathways through the block walls (sleeves, core holes etc) and the floor slab for all horizontal and backbone type cabling including all fire stopping. (Refer to Drawings for info.)

.12 General product specifications, design considerations, drawings and installation guidelines are provided in this package. In case of conflict, this document shall take precedence. The successful bidder shall meet or exceed all requirements for the cabling system described in this document.

.13 A new inter-building fiber optic up-link to the main computer room (C142) in the Gordon Willey building is planned to support the renovations in this project and for future projects within Simcoe Village. The fiber run will connect the basement LAN room within Simcoe Village phase 1, to phase 2 and onto room C142. Routing to be via existing inter-building underground communication duct system. Exterior fiber cabling, fiber panels, connectors, etc. shall be as specified in this document. Routing to be confirmed by College IT staff. This fiber link to be part of a cash allowance as noted in Division 1 specification section 01 10 00 General Instructions and shall not be included in tender amount by Communications Cabling Contractor.

1.2 REGULATORY REFERENCES AND STANDARDS

.1 All workmanship and materials supplied shall be in full conformance with applicable building, electrical, and other codes, as determined by the authority having jurisdiction (AHJ).

.2 All cabling system components shall be Underwriters Laboratories (UL) Listed and shall be marked as such. In cases where UL has no published standards for a component, any equivalent national independent testing standard shall apply and the item shall be appropriately marked. Where UL has an applicable system listing and label, the entire system shall be labeled.

.3 The product specifications, design considerations, and installation guidelines provided in this document are in part derived from recommendations found in recognized telecommunications industry standards. The following are used as reference:

.1 Spaces and Pathways

ANSI/TIA-569-B (2004) – Commercial Building Standard for Telecommunications Pathways and Spaces

.2 Grounding

ANSI-J-STD-607-B (2011) – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

.3 Cabling Systems

ANSI/TIA 568-C.0 Generic Telecommunications Cabling for Customer Premises.
ANSI/TIA 568-C.1 Commercial Building Telecommunications Cabling Standard.

.4 Cabling Administration

ANSI/TIA -606-B (2012) – Administration Standard for Commercial Telecommunications Infrastructure.

.5 Networking

IEEE Standard 802.3an (2506) – *10GBASE-T.*

.6 Design

BICSI Telecommunications Distribution Methods Manual (TDMM) – latest edition.

.7 Installation

BICSI Information Transport Systems Installation Manual (ITSIMM) – latest edition.

.8 In cases where product specifications, design considerations, and installation guidelines provided in this document are in conflict with the references listed above, the more stringent requirements shall apply. All references listed above were current during development of this publication.

.9 This document does not take precedence over any code, either partially or wholly.

.10 The Communications Cabling Contractor shall ensure that any local permits that are required to be obtained are obtained prior to starting any activity on the client's site and that any labour fair wages and union affiliation requirements are met.

.11 The Communications Cabling Contractor is to read and comply with all sections of this document.

1.3 CABLE MANUFACTURER

.1 The approved cabling manufacturer is Belden for horizontal Cat6 (2413) cabling, copper and fiber along with associated terminating hardware (no substitutes will be allowed).

.2 The bidder must have successfully completed all design and installation training provided by the manufacturers and is able to document successful completion of such training upon request.

.3 The bidder shall demonstrate proven expertise in the implementation of network cabling. Expertise can be illustrated through the inclusion of details of at least two projects involving the design and installation of a minimum 250MHz balanced (2413) utp twisted-pair cabling systems within the past two-year period.

.4 Names and contact information for each of the two projects shall be included in their bid response.

.5 The successful bidder shall hereinafter be referred to as the Communications Cabling Contractor.

.6 The Communications Cabling Contractor shall accept complete responsibility for the installation, acceptance testing, and certification of the successful 250MHz system.

.7 The Communications Cabling Contractor shall provide proof of its current manufacturer status and shall deliver a minimum ***250MHz System Certification*** for this project.

.8 All manufacturers' products must meet or exceed the specifications in this document. No alternatives will be accepted except where noted. Bidders must identify alternative products with their bids, including the manufacturer and part number.

.9 All manufacturers products installed must meet or exceed all local, provincial and federal building, fire, health, safety and electrical codes.

.10 The successful cabling contractor and their manufacture must be able to install and support the 25 year warranty.

1.4 APPROVED INSTALLERS

.1 The installation of the 250MHz (2413) system shall be performed by an ***authorized contractor from Belden.***

.2 The Communications Cabling Contractor may not assign or sub-contract any work without the prior written consent of the Client or their designated representative.

.3 All installation and testing shall be performed by a certified and supervised by individuals qualified to install and test the 250MHz system, in accordance with manufacture requirements. The supervisor(s) shall have successfully completed the manufacture training courses and be able to document successful completion of such training upon request.

.4 The Project Manager and lead tech that start the project must remain on the project until its competition. Changes to the Communications Cabling Contractor's project team may only occur with the prior consent of the client and the Communications Consultant.

.5 The Communications Cabling Contractor must comply with all job-site requirements (including fair wage requirements) for the duration of the project. The Communications Cabling Contractor shall make all necessary precautions, allowances and pre-cautions to comply with labour requirements of all unions on site to ensure that there will not be any disruption of work arising from the successful bidders work or workers.

.6 The Communications Cabling Contractor must comply with all requirements of the Occupational Health & Safety Act.

.7 It shall be the Communications Cabling Contractor responsibility to be aware of all current or impending legislation relating to employees, safety and fire regulations and shall be further required to acquaint their staff with this information. The Communications Cabling Contractor shall be responsible for being aware of all governing local municipal regulations and the Provincial Employment Standard concerning minimum wages, vacation pay, termination of employment etc.

.8 The Communications Cabling Contractor must be in good standing with the Workplace Safety and Insurance Board and the successful bidder will be required to provide to the client a certificate (Workers Compensation) to this effect.

.9 The Communications Cabling Contractor agrees to use only tradesman who are fully trained, qualified and experienced on the installation, termination and testing of a Certified Communication Cabling System. The installer must be an approved installer of the specific cabling system.

1.5 WORK INCLUDED

.1 The work included consists of all labor, equipment, products, and supplies required installing, testing, and certifying the 250MHz solution in compliance with the project specifications.

.2 The work included consists of (but is not limited to) the following:

.1 Pre-registration of the project with the successful manufacturer's Certified Project. A copy of the pre-registration request and manufacturer's approval shall be provided prior to project starting.

.2 Furnishing and installation of a complete balanced utp twisted-pair telecommunications cabling infrastructure capable of supporting 2 Gb/s networking.

.3 Furnishing, installation, termination, labeling and testing of all utp horizontal cabling.

.4 Furnishing, installation, termination, labeling and testing of the fiber backbone.

.5 Furnishing of any other material required to implement a complete system.

.6 Furnishing all test and labeling information in both electronic and paper formats.

.7 Providing training and complete documentation, including the Manufacturer's User Manual, Application Guidelines, and as-built drawings within [10] business days of project completion.

1.6 DELIVERY, STORAGE AND INSTALLATION INFORMATION

.1 Delivery and receipt of project materials shall be at the site, Whitby, Ontario and it will be the sole responsibility of the Communications Cabling Contractor to receive, move, secure and store all equipment and material. All delivery costs are to be included in the Communications Cabling Contractors proposal.

.2 All cable to be used in the project shall be stored according to manufacturer's recommendations. In addition, all cable must be stored in a protected area. If cable is stored outside, it must be covered with opaque plastic or canvas for protection from the elements, with adequate ventilation to prevent condensation. If air temperature at the cable storage location will be below 4.4 °C (40 °F), the cable shall be moved to a heated location [minimum 10 °C (50 °F)]. If necessary, cable shall be stored off-site at the Communications Cabling Contractor's expense.

.3 The Communications Cabling Contractor is allowed one (1) standard size job box on the site during construction. All tools, material and the job box are the sole responsibility of the Communications Cabling Contractor. The Communications Cabling Contractor is responsible for the complete storage, handling, moving, delivery and installation of all materials used in the performance of the work.

.4 The client is not responsible or liable for any missing material and/or tools belonging to the Communications Cabling Contractor.

.5 The Communications Cabling Contractor is responsible for keeping the workspace clean, safe and free from debris at all times. All debris must be removed from the site on a weekly basis. Costs associated for keeping the area clean is the responsibility of the Communications Cabling Contractor.

.6 Cleanliness of the site to be governed by the General Contractor/Construction Manager who may, after proper notice back charge the Communications Cabling Contractor for site clean up.

.7 It is the responsibility of the Communications Cabling Contractor to perform all cutting, patching and repair related to the communications cabling work.

.8 The Communications Cabling Contractor is responsible for the removal and re-installation of all ceiling/floor tiles in the areas affected by its work. This is to be completed on a daily basis for the areas affected.

.9 Any damage to ceiling tiles during the completion of any work outlined in this document is the responsibility of the Communications Cabling Contractor. Damage includes breaking, chipping or fingerprints. The decision with respect to any damage will be made by the General Contractor Project Manager and the Communications Consultant.

.10 The Communications Cabling Contractor is responsible for the storage and protection of the floor ceiling tiles that are removed for cable installation.

1.7 DRAWINGS

.1 All drawings and plans provided with this document are diagrammatic. They are included to show the scope of the project in order to assist in the development of bid documents. The Communications Cabling Contractor shall make allowances in the bid proposals to cover the work required to comply with the intent of the drawings, plans and all site conditions.

.2 The Communications Cabling Contractor shall verify all dimensions at the site and is responsible for their accuracy.

.3 Prior to submitting a bid, the Communications Cabling Contractor shall indicate:

.1 Any specified materials the Communications Cabling Contractor believes to be inadequate.

.2 Any necessary items of work omitted from the bid specification.

1.8 BID RESPONSE AND PRICING

.1 The Communications Cabling Contractor shall have a proven track record in cabling projects of a similar size to the one being tendered. The letter must include names, address and phone numbers of references for the two projects.

.2 Prices to be submitted are for a complete and functioning twisted-pair cabling system as intended in this specification. Prices are to include incidental fees and other fees for items required (that may or not be indicated in this document) to successfully install the cabling system. A successful installation of the cabling system is one that meets the requirements of this document, meets all local, provincial and federal building, safety fire and electrical codes, as well as all manufacturer's recommended guidelines.

.3 The Communications Cabling Contractor is required to report all errors and omissions in this document to the Communications Consultant with their Bid submission.

.4 Prices included in the bid response shall include a breakdown for labour and material.

.5 The bid response shall include a detailed list of all material and part numbers in accordance with Appendix "A" in this document. Failure to do so will result in immediate disqualification.

.6 The bid response shall include the Unit Price Schedule in accordance with Appendix "B" in this document. Failure to do will result in immediate disqualification.

.7 Bidders who find discrepancies or omissions in this RFP, or who have any doubt as to the meaning or intent of any part of this RFP, shall direct their questions or other inquires in writing to the RFP Contact. All questions will be answered and distributed to all bidders within 24 hours of receipt. Oral questions will not be answered. Questions will not be accepted or answered within 48 hours prior to the closing of the bid

.8 As part of the bid submittal respondents must include a detailed list of material BMO to be used on this project.

.9 The detailed material list will contain material description and supplier part number.

.10 The detailed material list will be used to verify material compliance to the approved design and will not represent quantities of items purchased.

1.9 PAYMENT

.1 The value for testing and documentation shall be set at 15% of the contract price for payment purposes. This amount will be withheld from the Communications Cabling Contractor until the testing and the correction of all deficiencies are 100% complete and all specific documentation has been handled over to the Communication Consultant. This amount will be in addition to any standard construction holdback that is withheld from the Communications Cabling Contractor.

Part 2 PART 2 – PRODUCTS

2.1 SYSTEM OVERVIEW

.1 The Belden 2413 balanced utp twisted-pair cabling system shall be available in bonded pair and/or non-bonded pair configurations.

.2 The balanced twisted-pair cabling system shall provide guaranteed performance up to a minimum of 250MHz and shall meet the specifications listed below for a 4-connector, 100 m (328 ft) channel.

.3 Test each Belden singlemode strand of fiber with a Power Meter/Light Source combination operating at wavelengths of 850nm and 1300nm for the Singlemode fibers. Perform these tests in both directions. Tabulate and include test results with documentation.

2.2 BALANCED TWISTED-PAIR CABLES

.1 The Belden 2413 4-pair balanced utp twisted-pair cables shall be available in bonded pair and/or non-bonded pair configurations. The characteristics listed below shall apply to both configurations.

.1 The cables will be plenum rated (CMP). The minimum recommended installation temperature shall be 5 °C (40 °F). The temperature rating shall be 60 °C (140 °F).

.2 The colour of the horizontal 250MHz data cable shall be **BLUE**.

.3 The cables shall have randomization elements along their lengths and on their cross- sections to minimize alien near-end crosstalk (ANEXT) coupling.

.4 The cable conductors shall be 23 AWG solid copper.

.5 The minimum bend radius shall be no greater than four times the OD of the cable.

.6 The transmission characteristics of the cable will be guaranteed to a minimum of 250 MHz. The guaranteed values will be as follows:

Maximum DC resistance (at 20 °C)	7.4 ohms/100 m (328 ft)
Maximum DC resistance unbalance	3 %
Maximum mutual capacitance	5.7 nF/100 m (328 ft)
Maximum capacitance unbalance (pair to ground)	50 pF/100 m (328 ft)
Maximum propagation delay skew	35 ns/100 m (328 ft)
NVP – plenum	72% @ 10 MHz
NVP – non-plenum	68% @ 10 MHz

DC = Direct current

NVP = Nominal velocity of propagation

2.3 UTP CONNECTORS

.1 The connectors used to terminate the 4-pair balanced twisted-pair cable shall have the characteristics listed below.

.1 The KeyConnect connectors shall be modular in form, with available mounting options for TOs. The dimensions of the connectors shall be as follows:
- 19.8 mm (0.78 in) in height
- 16.3 mm (0.64 in) in width
- 29.0 mm (1.14 in) in depth

.2 The PSANEXT isolation between modules must be greater than 70dB @ 100MHz when connectors are mounted side by side, top to bottom in a 48 ports 1U configuration.

.3 When mated to cordage, the transmission characteristics of the connectors will be guaranteed to 250 MHz. The minimum guaranteed values at 250 MHz will be as follows:

2	NEXT	3	38.1 dB
4	PSANEXT	5	54.1 dB
6	Return loss	7	12.1 dB

NEXT = Near-end crosstalk

PSANEXT = Power-sum alien near-end crosstalk

.4 All data KeyConnect RJ45's modules in the faceplate will be **BLACK**.

.5 Confirm all part numbers and colours before ordering with communication consultant.

2.4 UTP PATCH CORDS

.1 The work area cords, patch cords, shall have the characteristics listed below.

.1 The cordage shall use 23 AWG solid or stranded copper conductors in a bonded pair configuration for reliable long-term channel performance to 250 MHz.

.2 The nominal cable diameter of the cordage shall be no greater than 6.62 mm (0.26 in). The minimum bend radius shall be 26.5 mm (1.04 in).

.3 The cordage shall be available in multiple colors. Quantities listed below. **Supply only the utp patch cords listed below.**

CAT6 PATCH CORDS	LENGTH	QUANTITY
Blue (workstation)	7’-0”	One per data cable
Blue (wireless)	4’-0”	One per data cable
Blue (projector)	4’-0”	One per data cable
Blue (monitors)	4’-0”	One per data cable

.4 When mated to a connector, the transmission characteristics of the cordage will be guaranteed to a minimum 250 MHz. The minimum guaranteed values at 250 MHz will be as follows:

NEXT	38.1 dB
PSANEXT	54.1 dB
Return loss	12.1 dB

NEXT = Near-end crosstalk

PSANEXT = Power-sum alien near-end crosstalk

2.5 FACE PLATES

.1 Decora style faceplates equipped with three (3) ports, which will accommodate, RJ45 KeyConnect, type jacks.

.2 Faceplates equipped with three (4) ports, which will accommodate, RJ45 KeyConnect, type jacks.

.3 Faceplate colour to match electrical.

.4 Where applicable, use recessed blanks for all unused ports.

.5 Visible screws to Compatible with housings or plates with the decora style aperture.

.6 Two port side entry box.

.7 Compact in size for installation in confined areas.

.8 Can be mounted on flat surfaces.

2.6 CAT6 PIGTAILS

.1 Pigtail assemblies to be made of unshielded twisted pair cordage with 8-23 AWG thermoplastic insulated, solid copper conductors formed into individually twisted pairs and enclosed in a CMR rated thermoplastic jacket.

.2 Pigtails are to be factory assembled and not site prepared.

2.7 GIGABIX HARDWARE

.1 GIGABIX MOUNT

.1 Twelve connector mount to accommodate Cat6 cables.

.2 Sturdy plastic strips for easy snap in snap-out of the connectors.

.3 Plastic strips with keying features to prevent connector orientation mistakes.

.2 GIGABIX CONNECTOR 6 PORT

.1 Gas tight connection.

.2 200 insertions of any combination of wire gauge.

.3 Built in colour coded pair splitters to facilitate wire insertion and prevent termination errors

.3 GIGABIX TERMINATION BAR

.1 Clear plastic component that is used to position the wires when terminating on a GigaBIX connector.

.4 GIGABIX CONNECTOR 25 PORT

.1 Gas tight connection.

.2 200 insertions of any combination of wire gauge.

.3 Built in colour coded pair splitters to facilitate wire insertion and prevent termination errors

.5 GIGABIX WIRE GUARD

.1 Designed to protect minimum bend radius of twisted pairs.

.6 GIGABIX MANAGEMENT RING

.1 Interlock with GigaBIX mounts for quick and easy installation.

.2 High capacity allows for easier management using GigaBIX cross connect wire.

2.8 DATA RACK

.1 Frames are to be constructed of rugged 11 GA (0.120") steel and rigid.

.2 Frames are to be standard height of 7'-0" with 44 U of useable space and with 19" EIA 10-32 tapped mounting holes with permanently marked U-spacing identification.

.3 Frames to have a 5/16" sturdy steel base with anchor holes for mounting to floor.

.4 Rack is standard with 1 copper 10-32 x 0.5" L ground stud.

.5 The four post frame to be expandable up to a minimum of 42 inches.

.6 Approved manufactures are Netversity, RF Mote and Hammond.

2.9 FIBER PATCH PANEL

.1 The rack mountable fiber patch panels shall be used for cross-connecting or interconnecting purposes.

.2 The fiber optic patch panel shall be mounted in a 19" (482mm) rack.

.3 The fiber optic patch panel shall be 1U high and be black in colour.

.4 The unit shall have a patch cord routing guides that allow a transition and segregation for fiber optic patch cords to exiting the sides of the fiber patch panel.

.5 The fiber optic patch panel allows for splicing with optical pigtails using a splice organizer tray.

.6 The small wall mount fiber patch panel shall be used for cross-connecting or interconnecting purposes.

.7 The small wall mount fiber patch panel shall have independent doors, flexibility custom configuration through universal adapter strips and key lock.

2.10 OPTICAL FIBER ADAPTER STRIPS

.1 An adapter strip is defined as a modular removal plate containing fiber optical connectors.

.2 The adapter strip shall utilize a single mounting footprint and the colour shall be black.

.3 The adapter strip shall be attached with two push-pull latches to allow for quick installation and removal.

.4 The double density six (6) "LC" adapter strip shall be Phosphor Bronze for multimode and Zirconia Ceramic for Single mode fiber.

2.11 SINGLEMODE "LC" FIBER CONNECTORS

.1 The fiber optic "LC" connector shall be field installable 09/125µm connectors for singlemode type fiber.

.2 The connector shall provide a strain relief mechanism for installation of a single strand of fiber that contains strength elements. The fiber within the body of the connector shall be isolated mechanically from cable tension bending and twisting.

.3 The connector must be capable of mounting on either 900 micron tight buffered fiber, 3.0mm jacketed fibers and 250 micron loose tube fibers.

.4 The connector shall have a ceramic ferrule and a factory PC polish.

.5 The connector must have a locking feature to the coupler.

.6 LC connector to perform to the following design requirements:

.1 Maximum Attenuation of 0.3dB.

.2 Typical Attenuation of <0.2 dB.

.3 Connector Durability 0.2dB/1000 insertions.

2.12 OPTICAL FIBER PATCH CORDS

.1 Duplex fiber optic patch cords, Singlemode 9/125µm equipped with LC to LC connectors.

.2 Cables are to meet the same performance criteria for Singlemode 9/125µm type fiber.

.3 Patch cords are to be factory assembled and note site prepared.

.4 LC to LC patch cords shall be 7'-0" in length (LAN, electrical room & data center). (quantity is 6)

.5 Confirm with the IT consultant before ordering on the type of connectors.

2.13 FIBER BACKBONE CABLING (INDOOR)

.1 Backbone cables shall consist of distribution type cable non plenum rated 12 strand 9/125µm single multimode fibers into groups of 6 fiber sub-units.

.2 Groups are to be assembled to form a single compact core and covered by a protective sheath.

.3 Full dielectric construction, no grounding required.

.4 Length markings in meters.

.5 Distribution fiber optic cables to meet or exceed performance standards as established by ANSI TIA 568-C series of standards.

2.14 OVERHEAD CABLE TRAY

.1 The Electrical Contractor is responsible for the ***overhead basket cable tray system*** that responsibility includes grounding, bonding, supply and installation of the tray system based on the information provided within this document.

.2 The Communications Cabling Contractor is to report back to the Communications Consultant and or GC any concerns related to the installation of the tray.

.3 The Electrical Contractor must be fully trained and authorized on either CER (Canadian Electrical Raceway), Flex Tray, Cablofil or WBT overhead cable tray products.

.4 The following two methods will be allowed to support the cable tray (Profile or Trapeze) type hardware.

.5 Drop-Outs shall be incorporated in the overhead cable tray and at the backboard in the LAN room for the horizontal, pigtails and backbone type cabling.

2.15 VERTICAL WIRE MANAGERS

.1 Frame black smooth paint finish.

.2 Fabricated of 16 GA (0.060") steel

.3 Channel style supports heavy cable load, while maintaining clean concealed appearance.

.4 The vertical cable manager shall have a hinged door(s) with a positive locking mechanism (non-magnetic)

.5 The vertical wire manager shall have stiffeners welded inside for additional strength.

.6 The openings for cable routing shall have grommets to ensure a smooth transition of the patch cords.

.7 Both vertical wire managers shall be a minimum of 8" w x 6" d.

.8 Approved manufactures are Netversity, RF Mote and Hammond.

2.16 VERTICAL POWER BAR

.1 Fabricated from 18 GA (0.048") steel.

.2 Slim profile power bars mount into 19" EIA cabinet frames or network racks.

.3 Features breaker protection with reset button, three-stage surge protection, three-prong power cord and power outlets.

.4 Illuminated power switch showing power "ON".

.5 Comes standard with a 6-10' power cord.

.6 Comes standard in 15 amp capacity.

.7 Comes with a minimum of 10 outlets.

.8 A minimum 2 inch standoff brackets are required for each power bar on the data rack.

.9 Approved manufacturers are Netversity, RF Mote and Hammond.

Part 3 PART 3 – EXECUTION

3.1 WORK AREA INSTALLATION

.1 Work area TO's (Telecommunication Outlet) shall be installed in accordance with:

.1 Standards-based recommendations.

.2 The manufacturer's recommendations and installation guides.

.3 Industry best practices.

.2 Cables shall be dressed and terminated in accordance with:

.1 Standards-based recommendations.

.2 The manufacturer's recommendations and installation guides.

.3 Industry best practices.

.3 Slack cable to be coiled if adequate space is provided to house the slack cable without exceeding the manufacturer's installation guidelines. Include 10 feet of slack at the location for the workstation (stored in accordance with manufacturer's installation guidelines) to allow for future outlet relocation.

.4 For all wireless include 30 feet of slack for future relocation.

.5 Pair untwist at the termination point shall not exceed 13 mm (0.5 in).

.6 Bend radius of the cable in the termination area shall not be less than 4 times the OD of the cable.

.7 The data RJ45 KeyConnect connector at the outlet will be **BLACK** in colour and shall occupy the top position of the decora (minimum 3 holes) type white faceplate (top to bottom). The 1st data RJ45 connector in the horizontally oriented faceplates shall occupy the top left-most positions. Use blanks for all unused ports. Blanks to match faceplate color

.8 Contractor to supply and install all faceplates that are ganged with electrical.

.9 Contractor to cut drywall large enough for the 2 port surface box to be removed if required.

.10 Faceplate colour to match electrical.

.11 Refer to faceplate drawings in this document for more information.

.12 Wireless data KeyConnect RJ45 connectors will be **BLACK** in colour and shall occupy a two port white side entry box.

.13 Where communications is ganged with electrical decora type inserts are to be used and the colour is to match electrical.

.14 Cabling contractor to supply cover plates for electrical and communications.

.15 Include all necessary furniture adapters/spacers etc. in your pricing to ensure the faceplate can be properly installed in the furniture type inserts while maintaining a proper bend radius.

3.2 HORIZONTAL CABLE INSTALLATION

.1 Cable shall be installed in accordance with:

.1 Standards-based recommendations.

.2 The manufacturer's recommendations and installation guides.

.3 Industry best practices.

.2 All cable ties shall be black Velcro style. ***Plastic cable ties are not allowed***. If found on site during any phase of the project, the plastic cable ties will be removed, along with all cabling components contained within them, and the removal and the re-cabling shall be at the Communications Cabling Contractor's expense.

.3 All exposed cables in the LAN room are to be placed in a neat and professional manner and routed in accordance with the specifications and drawings provided.

.4 Use cable tray pathways, J hooks and conduits for all horizontal and backbone cabling.

.5 All exposed cabling at the workstation between the wall/floor and the furniture access locations is to be wrapped with black split loom tubing manufactured by PANDUIT Canada, size and length as required to suit.

.6 No cable shall exceed 90 meters. Any cables longer than 90 meters shall be reported immediately to the Client or their representative.

.7 Cable raceways shall not be filled greater than the TIA/EIA-569-B recommended maximum fill for the particular raceway type, or 40% whichever is less.

.8 At no point shall cable(s) rest on acoustic ceiling grids, water pipes, HVAC, metal conduits, t-bar hanging rods or ceiling panels.

.9 **As applicable – to be determined by site.** Horizontal cables shall be supported with **Cat 6 "J" hook** cable type products and bundled in groups of no more than 15 cables from the workstations to the overhead basket cable tray or conduit. Cable bundle quantities in excess of 15 cables may cause deformation of the bottom cables within the bundle, which will degrade the performance of those cables.

.10 Cable shall be installed above fire-sprinkler systems and shall not be attached to such systems or any associated ancillary equipment or hardware. The cabling system and its associated pathways shall be installed so that they do not obscure any valves, fire alarm conduit(s), boxes, or other control devices.

.11 Cable shall not be attached to ceiling grid support rods, conduits, water pipes HVAC ducts or lighting fixture wires. Where support for horizontal cable is required, the Communications Cabling Contractor shall install appropriate carriers to support the horizontal voice and data cabling listed in this document.

.12 The overhead cabling infrastructure shall be self-supporting.

.13 Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the communication contractor prior to final acceptance at no cost to the owner of the cabling system.

.14 All cables shall be identified by a self-adhesive label in accordance with the System Documentation section of this document and TIA/EIA-606-B standard.

.15 The data cable label shall be applied within four inches on the cable behind the faceplate, within four inches of the data patch panel termination.

.16 Balanced utp twisted-pair cable shall be installed so that there are no bends smaller than 4 times the OD of the cable at any point in the run.

.17 The Communication Cabling Contractor is responsible for supply and installation of all split faceplates for wall or floor fed locations for furniture.

.18 The Communication Cabling Contractor is responsible for cleaning all conduits prior to pulling any cable.

.19 To minimize any possibility of disruption, maintain the following minimum clearances from electrical and heat sources when routing cables:

CLEARANCES TABLE	
Item	**Minimum Clearance**
Motor	1.2 m (4’-0”)
Transformers	1.2 m (4’-0”)
Conduit and cables used for electrical distribution less than 1kV	0.3 m (1’-0”)
Conduit and cables used for electrical distribution greater than 1kV	1.0 m (3’-0”)
Fluorescent Luminaires	12 cm (5”)
Pipes (gas, oil, water, etc.)	0.3 m (1’-0”)
HVAC (equipment, ducts, etc.)	15 cm (6 “)

3.3 FIBER BACKBONE INSTALLATION (OUTDOOR)

.1 Fiber backbone shall be installed and terminated in a fiber patch panel using fiber breakout kits at the top of the data rack located in the LAN room and in a wall mount fiber patch panel in the new electrical room in the existing campus building.

.2 Terminate the fiber optic cable in the appropriate rack mounted fiber patch panel located at the top of the LAN data rack using adapter strips with “LC” type connectors.

.3 Fiber backbone will be installed in conduit between the two building locations to permit future use of the conduit.

.4 Terminate, test, label and document all strands as specified in this document.

3.4 DATA CABLE INSTALLATION

.1 Cables shall be dressed and terminated in accordance with:

.1 Standards-based recommendations.

.2 The manufacturer’s recommendations and installation guides.

.3 Industry best practices.

.2 All horizontal data cabling shall be 4pr (2413) plenum rated cable and shall be BLUE.

.3 At the workstation faceplate, terminate each data cable on 250MHz type, 8 RJ45 position KeyConnect jack wired 568A ISDN standard.

.4 In the LAN room the data cabling will be terminated on GigaBIX type hardware (GigaBIX mounts, 6 port connectors, termination bars, wire guards, designation strips and labels)

.5 In the LAN room the pigtail cabling will be terminated on GigaBIX type hardware (GigaBIX mounts, 6 port connectors, termination bars, wire guards, designation strips and labels)

.6 The pair untwist at the termination point shall not exceed 13 mm (0.5 in).

.7 The bend radius of the cable in the termination area shall not be less than 4 times the OD of the cable.

.8 Cables shall be neatly bundled, dressed, and routed to their respective termination connectors.

.9 Each utp and pigtail cable shall be clearly labeled on the cable jacket within 4 inches of the termination behind the terminations at each end. Labels obscured from view will not be acceptable and will be replaced by the Communications Cabling Contractor at no cost to the client.

.10 The Communication Cabling Contractor is to follow section (horizontal cable installation) and other sections outlined in this document.

3.5 DATA RACK INSTALLATION (IF APPLICABLE)

.1 Locate rack as shown in this document so the water fall brackets from the overhead pigtail cable tray allow the cables to fall into the vertical wire managers.

.2 Anchor racks securely to floor and level rack appropriately.

.3 Ground rack to the busbar located in the LAN room using #6 AWG insulated ground wire.

3.6 GROUNDING AND BONDING SYSTEM

.1 The telecommunications bonding backbone (TBB) shall be designed and/or approved by a qualified Professional Engineer (PE), licensed in the jurisdiction where the work is to be performed. The TBB shall adhere to the recommendations found in ANSI-J-STD-607-B and shall be installed in accordance with industry best practices.

.2 A licensed electrical contractor shall perform the installation and termination of the main bonding conductor to the building service entrance ground.

.3 The grounding and bonding approach recommended in this specification shall meet the requirements of all current Canadian codes and standards and is intended to work in concert with the cabling topology as specified in this document.

.4 The telecommunications grounding and bonding infrastructure supports a multivendor, multiproduct environment as well as the grounding practices for various systems that may be installed on the customer premises.

.5 A separate ground shall be established for the telecommunications system. Where this is not possible the telecommunications system ground shall be tied into the building/electrical ground.

.6 Grounding to the conduit system or cold water pipes will not be permitted.

.7 One #6 AWG ground wire shall be installed with proper mounting hardware from the data rack to the busbar located in the LAN room by the cabling contractor.

.8 One #6 AWG ground wire shall be installed with proper mounting hardware from the overhead basket cable tray to the busbar located in the LAN room by the cabling contractor.

.9 The grounding and bonding of the telecommunications system shall meet all local, provincial and national codes and bylaws.

.10 The grounding and bonding of the telecommunications system shall meet all BICSI and JSTD-607-B requirements.

.11 Ensure that metal to metal contact is made when grounding to paint or powder coated surfaces for all patch panels.

3.7 FIRE STOPPING

.1 All fire stop systems shall be installed in accordance with the manufacturer's recommendations and installation guides and shall be available for inspection by the [AHJ] prior to acceptance.

.2 All fire stopping must meet applicable federal, provincial and local building codes.

.3 Supply and install non-permanent CSA approved intumescent fire stopping, cap all empty sleeves, conduits, slot and penetrations and around cabling passing through sleeves, cable trays, slots and penetrations located in the telecommunications room on both sides of the wall.

3.8 IDENTIFICATION AND LABELING

.1 Labeling shall be in accordance with:

.1 The recommendations found in TIA/EIA-606-B.

.2 The manufacturer's recommendations and installation guides.

.3 Industry best practices.

.2 All adhesive cable labels shall meet the legibility, defacement, and adhesion requirements specified in UL 969 (Ref. D-16). In addition the labels shall meet the general exposure requirements in UL 969 for indoor use.

.3 Cable Labels shall be self-laminating vinyl construction with a white printing area and a clear tail that self-laminates the printed area when wrapped around a cable. The clear area should be of sufficient length to wrap around the cable at least one and one-half times.

.4 Labels are to be mechanically printed using a laser printer and are to follow the guidelines in TIA/EIA-606-B for colour coding.

.5 Hand written labels are not permitted on any horizontal or backbone cabling, faceplates, GigaBIX labels etc.

.6 Label all cables in accordance with this document and 606-B Standards. One label should be attached to the front of the workstation faceplate, one to the front of the patch panel, and one within 4 inches of each end of the horizontal utp cable.

.7 The labeling scheme for this project is as follow: floor number and jack number: (3D-001 to 3D-999) (3-WAP-001 to 3-WAP-999).

.8 The labeling scheme for the pigtails is as follows: switch number, port number (S#--P01 to S#-P048 or 96 depending on switch type).

.9 Leave 25% growth for utp (cable wraps, faceplate and GigaBIX labels) and two sets for switch growth.

COLOR	*BELDEN PART #*	*TERMINATION TYPE*
Orange	AX101534	Demarc Point (Central office termination)
Green	AX101537	Network Connection to Equipment
Purple (USA) White (Canada) Silver (Canada)	AX1015 39 AX1015 33 AX1015 41	Common Equipment (PBX), Computers, LANs and multiplexers
White (USA) Purple (Canada)	AX1015 33 AX1015 39	1st Level Backbone (ER to TR)
Gray Blue	AX101532 AX101538	2nd Level Backbone (TR to TR) Termination of workstation cabling in the TR and equipment room, not at telecommunication outlet
Brown	AX101540	Interbuilding Backbone
Yellow	AX101536	Miscellaneous
Red	AX101535	Key Telephone Systems

3.9 TESTING AND ACCEPTANCE

.1 General

.1 All terminated horizontal and fiber backbone cabling runs shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements found in the TIA/EIA-568-C series of standards. All pairs in each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation, including (but not limited to) cables, connectors, and cordage shall be repaired or replaced in order to ensure 100% usability of all installed runs.

.2 Acceptable testers are as follows:

.1 Wirescope 350

.2 Fluke DSP 4000

.3 Microtest Omniscanner HP/Agilent

.3 Upon completion of the testing by the Communications Cabling Contractor, the Communications contractor may be ask to submit the test results for the various work activities to the client or their designated representative within two business days.

.4 Failure to provide test results upon request will require the communication cabling contractor to retest the all horizontal cabling related to the project with no cost to the client.

.5 All horizontal permanent link tests are to be performed using a LEVEL IIIe tester equipped with the most recent version of its firmware and in accordance to ANSI/EIA/TIA-568-C series standard.

.6 Testing includes all horizontal cabling including pigtails (Faceplate RJ45 to the end of the pigtail including cross connects).

.2 Copper Channel Testing

.1 All balanced twisted-pair cable links shall be tested for basic continuity and length, as indicated below. Additional testing parameters to verify compliance with the 250MHz performance are listed in the System Overview section of this document (Section 2.1.).

.2 Of the parameters listed in [Section 2.1.], it is understood that PSANEXT requires more elaborate measurement instruments and this feature may not be available using current field test equipment. If this feature is available such test will be done on a sampling basis, and analyzed using statistical techniques.

.3 Continuity – Each pair in every installed cabling run shall be tested using a test set that detects and identifies opens, shorts, polarity and pair reversals, crossed pairs, and split pairs. The results shall be recorded as Pass/Fail (as indicated by the test set) and referenced to the appropriate cable identification number and circuit/pair number. Any fault shall be corrected and the run re-tested prior to final acceptance.

.4 Length – Every installed cabling run shall be tested for installed length. The cable length for a permanent link shall not exceed 90 m (295 ft). The cable length shall be recorded, referencing the cable identification number and circuit/pair number.

TIA/EIA-568-B.

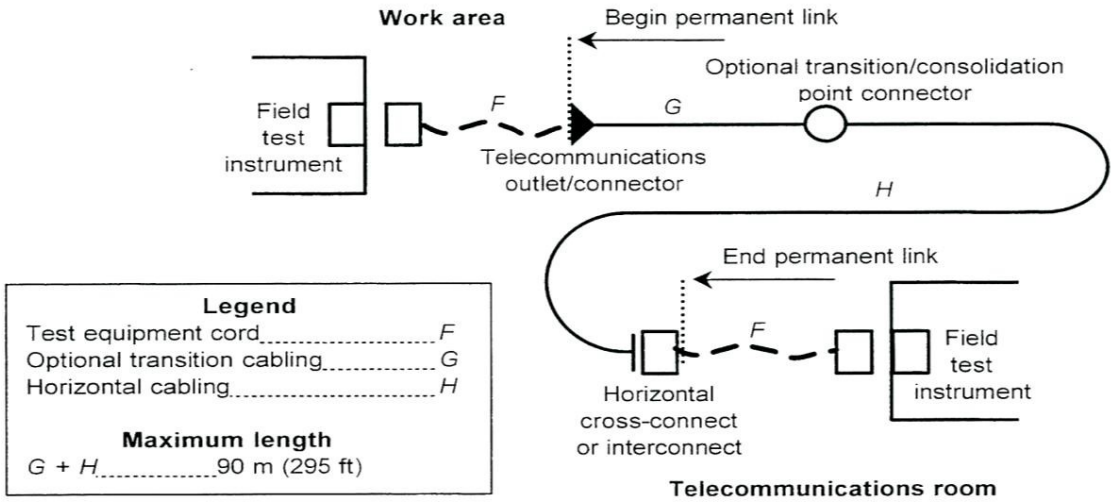


Figure 11-2 Schematic representation of a permanent link test configuration

NOTE – If cross-connections are used, then channel testing is recommended.

3.14 SYSTEM

.1 Upon completion of the installation, the Communications Cabling Contractor shall provide **two (2) marked up cable drawings** indicating all cable drops ID's within four **(4) business days of completing the work**.

.2 The report will indicate for each horizontal cable when it was tested successfully, the result and the length.

.3 There shall be a copy of this communication specification along with all drawings on the job site at all times during the length of the project.

3.10 SITE CLEAN-UP

.1 The Communication cabling contractor is responsible for removing all trash including, cabling, cardboard boxes and all other cabling debris to outside garbage containers on a daily basis by the end of each day or as needed during the course of the day. No trash or debris is to be left in any of the telecommunications rooms. This includes removing trash cans or other forms of garbage collection devices at the end of each day. Communication Cabling Contractor shall provide a complete clean up of the rooms.

.2 Workstation outlet location areas shall be cleaned on an on-going basis each time the Communication Cabling Contractor completes any activity in the area.

3.11 AS-BUILT DRAWINGS

.1 The Communications Cabling Contractor shall provide **two (2) marked up cable drawings** for the floor indicating all cable drops ID's **five (5) business days prior** to the cutover weekend.

.2 Once the cutover has been completed the Communications Cabling Contractor will provide two (2) soft copies in AutoCAD Release R2500 or better format and a total of two (2) plotted sets of drawings for the client after the Communications Consultant review of the drawings.

.3 All documentation must be submitted to the Communications Consultant within ten (10) business days of the completion of the project. The documentation (test results, drawings) will be reviewed and, once approved by the Communications Consultant, the holdback will be released.

.4 At the completion of the cabling project a copy of the floor plan will be left in the TR room by the Communications Cabling Contractor. This floor plan is to accurately reflect the final cabling system including tray routing and cable workstation identification numbers. The floor plan 24" x 36" is to be hung on the wall behind Plexiglas along with the cross connect sheets by the Communication Cabling Contractor within 2 weeks of migration.

.5 Once approved by the communications consultant, the Communications Cabling Contractor will to provide the client with the following:

.1 Two sets of drawings for the client.

.2 One set of drawings for the Communications Consultant.

3.12 TEST RESULTS

.1 Test documentation shall be provided on permanent media within three weeks after the completion of the project. The media shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or connector) ID, measurement direction, reference setup, and technician name(s). The test equipment name, manufacturer, model number, serial number, software version, and last calibration date will also be provided. Unless the manufacturer specifies a more frequent calibration cycle, proof of annual calibration must be documented for all test equipment used in this installation.

.2 The test equipment shall meet the requirements found in the TIA/EIA-568-C series of standards.

.3 Printouts generated for each cable by the test equipment shall be submitted as part of the documentation package. Alternately, the Communications Cabling Contractor may furnish this information in electronic format on permanent media. The media shall contain the electronic equivalent of the test results as defined by the bid specification, in a file format compatible with Microsoft Word (version 6.0).

.4 When repairs and re-tests are performed, the problem(s) found and the corrective action(s) taken shall be noted. Both the failed and passed test results shall be documented and provided with the final test results. No penalties will be applied for corrective action prior to substantial completion of the project.

3.13 CHANGE NOTICES

.1 All change notice pricing will include a detailed breakdown including the following:

.1 Part number

.2 Unit Cost

.3 Labour Costs as per APPENDIX B PST

.4 Mark ups for overhead and profit as per APPENDIX B of this document Total price of the Change Notice

3.14 CUTOVER SUPPORT

.1 Two (2) technicians will be on site the day after the cutover (8am to 5pm). Refer to construction schedule for more information.

.2 The Communications Cabling Contractor's technicians will be required to be on site equipped with all necessary tools, including test equipment, answer questions and test any cables identified by the client or the Communications Consultant. Repair any deficiencies that arise from the weekend of the cutover.

.3 All work activity will be updated on the As Built drawings after the weekend cutover.

3.15 QUALIFICATION OF SYSTEM

.1 The installed horizontal cabling system shall be covered by the Manufacturer's Certification, issued by the successful manufacture and delivered by the Communications Cabling Contractor to the client.

.2 The installed horizontal cabling system shall conform to all applicable local building and electrical codes.

.3 The manufactures representative shall attend the site, as appropriate, in order to inspect the installation of the various phases of the project and to confirm that the installation is being performed in accordance with the manufacturer's installation guidelines. The manufacture shall provide documentation, if required, evidencing the date and time that such inspections were performed and the results of such inspections.

3.16 25-YEAR COMPONENT WARRANTY

.1 The manufacture shall provide a minimum twenty five (25) year warranty for all manufactured passive components used in the installation of the 250MHz cabling system. Defective and/or improperly installed products shall be replaced and/or reinstalled at no cost to the client.

3.17 CERTIFICATION

.1 To qualify for System Certification, the manufacture of the 250MHz system shall be designed, installed, and tested by the Certified Communications Cabling Contractor for this project.

.2 To qualify for System Certification, the installed cabling system shall fully comply with all relevant manufacturer design and applications guidelines, including any pre-approved deviations as specified in the latest release of the manufacture Certification Guide.

.3 To qualify for System Certification, only products made or approved by the cabling manufacturer shall be used to ensure the end-to-end performance of the manufacturer's cabling system. The manufacturer's minimum 25-Year Component Warranty and Lifetime Application Assurance can only be provided to installations consisting of products supplied by the manufacture of the cabling system.

.4 The successful manufacturer will not provide certification or warranty coverage for products manufactured by other entities.

.5 The Communications Cabling Contractor will provide a pre-approved draft of the manufacturer's Letter of Certification within two weeks of award of this project. The document must include the following:

.1 Verification of the performance of the installed cabling system.

.2 Manufacturer's Certification Number.

.3 Identification of the Installation by location and project number.

3.18 CERTIFICATION

.1 Submit Shop Drawings for all telecommunications system components in accordance with Section 26 01 16.

.2 Catalog cut sheets with performance specifications demonstrating compliance with specified requirements.

APPENDIX A: PRODUCT LIST BILL OF MATERIAL

Please submit a ***detailed Bill of Materials*** with the proposed components as indicated below. The cabling contractor is to provide a Bill of Materials (BOM) with their project pricing that reflects the following format:

Cable Information	**Quantities**
Total number of data cables (workstations)	
Total number of data cables (wireless)	
Total number of data cables (projectors)	
Total number of data cables (monitors)	
Grand Total of data cables	

Product Description	**Part Number**	**Quantity**

Total Material Cost	$
Total Labour Cost	$
Total Misc. Cost	$
Total Project Cost (excluding HST)	$

APPENDIX B: UNIT PRICES

The unit prices supplied below will be used for all additions, deletions and/or changes to the enclosed Scope of Work. The contractor will include all materials, labour, testing, overhead, profit, permits and incidental fees to supply and/or install the items listed for a 250 MHz cabling solution. All components used in the Unit Pricing shall be the same as specified in this document.

	ADD	DELETE
Supply, install and test one additional wall/floor/furn outlet complete with one (1) 250MHz-4pr CMP cables. Cable length to be 275 feet.	_____/each	_____/each
Supply, install and test one additional wall/floor/furn outlet complete with two (2) 250MHz -4pr CMP cables. Cable length to be 275 feet	_____/each	_____/each
Supply, install 24 Cat6 pigtails to GigaBIX hardware	_____/each	_____/each
Supply, install 48 Cat6 pigtails to GigaBIX hardware.	_____/each	_____/each
Supply only, one 7 foot LC to LC fiber patch cord	_____/each	_____/each
Supply only, 250MHz patch cables at 4 feet. (Blue)	_____/each	_____/each
Supply only, 250MHz patch cables at 7 feet. (Blue)	_____/each	_____/each
Supply only, 250MHz patch cables at 10 feet. (Blue)	_____/each	_____/each

Note: The data cables will be terminated on GigaBIX type hardware (include the RJ45 module in the unit pricing for the data cable). Include all necessary hardware, labels, labour and testing in your unit pricing for complete a complete termination.

Indicate the profit percentage and overhead that will be used for material on all changes, not covered under unit prices, for the duration of the project.

_____%Overhead _____& Profit

Indicate the labour rate that will be used on all changes, not covered under unit prices, for the duration of the project. This rate includes all overhead and profit.

$_____/hr Regular Time $_____/hr Shift Premium

Part 1 General

1.1 REFERENCES

.1 CAN/ULC-S524 (latest edition), Installation of Fire Alarm Systems.

.2 ULC-S525 (latest edition), Audible Signal Appliances for Fire Alarm Systems.

.3 CAN/ULC-S526 (latest edition), Visual Signal Appliances, Fire Alarm.

.4 CAN/ULC-S527 (latest edition), Control Units, Fire Alarm.

.5 CAN/ULC-S528 (latest edition), Manual Pull Stations.

.6 CAN/ULC-S529 (latest edition), Smoke Detectors.

.7 CAN/ULC-S530 (latest edition), Heat Actuated Fire Detectors, Fire Alarm.

.8 CAN/ULC-S531 (latest edition), Smoke Alarms.

.9 CAN/ULC-S536 (latest edition), Inspection and Testing of Fire Alarm Systems.

.10 CAN/ULC-S537 (latest edition), Verification of Fire Alarm Systems.

.11 OBC-2012, Ontario Building Code.

1.2 DESCRIPTION OF SYSTEM

.1 System includes:

.1 Existing control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating general alarm, supervising system continuously, actuating zone annunciators, and initiating trouble signals.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

.1 This system is subject to review by local building department officials, local fire department officials. **Therefore, submission of verification certificate and field technician device verification sheets is required prior to inspection by these officials. Schedule accordingly.**

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Electrical General Requirements Section.

1.5 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for Fire Alarm System for incorporation into manual specified in Electrical General Requirements Section.

.2 Include:

.1 Technical data - illustrated parts lists with parts catalogue numbers.

.2 Copy of approved shop drawings.

1.6 SYSTEM OPERATION

.1 Operation of any alarm initiating device to:

.1 Cause audible and visual signal devices to sound throughout building.

.2 Transmit signal to fire department via monitoring station.

.3 Cause zone of alarm device to be indicated on control panel and remote annunciator(s).

.4 Cause air conditioning and ventilating fans to shut down and to function so as to provide required control of smoke movement.

.5 Cause fire doors and smoke control doors if normally held open, to close automatically.

.6 Log the alarm in the historical alarm log file.

.2 System Reset

.1 It shall not be possible to reset the fire alarm system until all the alarm zones have been properly reset or cleared.

.3 System Trouble Operation

.1 A trouble initiated by the actuation of a sprinkler system supervisory trouble switch shall cause the following to occur:

.1 An audible and visual trouble signal shall sound at the main control panel Only until acknowledged by an operator.

.2 Annunciate the Supervisory Trouble Alarm at the main control panel LCD Display and all remote annunciator(s).

.3 Log the Supervisory Trouble Alarm in the Historical Trouble Log File.

.4 Cause the remote trouble indicator to activate

.2 Any system trouble shall cause the following to occur:

.1 An audible and visual trouble signal shall sound at the main control panel LCD Display Only until acknowledged by an operator.

.2 Log the trouble condition in the separate Historical Trouble Log File.

1.7 PERFORMANCE CRITERIA

.1 These specifications describe the minimum functional requirements for an electronically supervised, microprocessor based, fully integrated system. The initial installation shall include all the necessary electronic hardware, software and memory for a completely operable system in accordance with these specifications.

1.8 QUALITY ASSURANCE

.1 Each and all items of the fire alarm system shall be listed as the products of a single manufacturer under the appropriate category by the Underwriter's Laboratories of Canada and shall bear the "U.L.C." label.

.2 Each and all items of the fire alarm system shall be covered by a one year parts and labour warranty covering defects resulting from faulty workmanship and materials. The warranty shall be deemed to begin on the date the system is accepted by the Project Manager on issuance of the substantial performance certificate for the project.

.3 All control equipment must have Transient Protection Devices to comply with U.L.C. requirements.

Part 2 Products

2.1 GENERAL

.1 The existing fire alarm system is an addressable, single stage, zoned, non-coded, indicating, fully integrated fire alarm.

2.2 AUDIBLE/VISUAL SIGNAL DEVICES

.1 Horn: flush mounted temporal horn, 24Vdc operation, 94 dBA rating at 3 m (10'), red finish, FM and ULC listed.

.2 Mini Horns: flush mounted temporal mini horn, 24Vdc operation, selectable HIGH/LOW setting 94.5 dBA (high)/89.8 dBA (low) at 3 m (10'), white or red coverplate, FM and ULC listed. Suitable for mounting on a single gang box.

.3 Strobe: semi-recessed, 24Vdc operation, complete with selectable 15/30/75/110 candela output (unless otherwise noted set at 75 cd), synchronized strobe, red finish, FM and ULC listed. Suitable for mounting on a single gang box.

.4 Mini Horn/Strobe: flush mounted temporal combination mini horn/strobe, 24 Vdc operation, selectable HIGH/LOW setting 94.5 dBA (high)/89.8 dBA (low) at 3 m (10') selectable 15/30/75/110 candela output (unless otherwise noted set at 75 cd), synchronized strobe white or red coverplate, FM and ULC listed. Suitable for mounting on a single gang box.

NOTES:

.1 Any surface mounted signal devices must be provided with suitable backboxes supplied by the manufacturer.

.2 Provide synchronization modules to suit signal devices (if required by manufacturer).

2.3 END OF LINE RESISTORS

.1 End-of-line resistors for signalling circuits shall be sized to ensure the correct supervisory current flows in each circuit.

.2 End-of-line resistors shall be mounted on a stainless steel plate for mounting on a standard single gang box and bear the ULC label.

2.4 GRAPHIC DISPLAY (PASSIVE)

.1 Include in contact to update existing fire alarm graphic.

2.5 ISOLATOR MODULE

.1 Fault isolator modules shall be provide to automatically isolate wire-to-wire short circuits on an SLC loop. The fault isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop. If a wire-to wire short occurs, the fault isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the fault isolator module shall automatically reconnect the isolated section of the SLC loop. The fault isolator module shall not require any address-setting, and its' operations shall be totally automatic. It shall not be necessary to replace or reset a fault isolator module after its normal operation. The fault isolator module shall mount in a standard 10.16 cm (4") deep electrical box, in a surface-mounted backbox, or in the fire alarm control panel. It shall provide a single LED which shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

2.6 SYSTEM WIRING

.1 The system wiring must be FSA rated in conformance with the Electrical Safety Code to suit the type of installation.

.2 Wiring shall be minimum #18 AWG twisted shielded pair in conduit. "Securex 2" armoured cable will be permitted to be used for "drops" to devices on accessible ceilings.

.3 As indicated on system riser diagram initiating device wiring shall be run in a loop with a home run from the last device to the control panel (Class 'A' configuration).Wiring from the "loop" module to conventional devices must be supervised, run in conduit, and conform to the standards of the Electrical Safety Code.

.4 Signal wiring is to be cross connected in a class 'B' configuration.

.5 Install isolator modules and end of line resistors in service rooms no higher than 2.4 M AFF. Provide location of these devices at the time of shop drawing submission.

.6 **These are the basic wiring requirements for system operation. Prior to tender close manufacturer and contractor are to confirm all necessary wiring specifications and requirements.**

2.7 PPROVED EQUIPMENT

DEVICE	**EDWARDS**
.1 CONTROL PANEL	EST 3 (EXISTING)

Part 3 Execution

3.1 INSTALLATION

.1 The entire system shall be installed in accordance with CAN/ULC-S524 (latest edition) and approved manufacturers manuals and wiring diagrams. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation, All wiring shall be of the type recommended by the Electrical Safety Code, approved by local authorities having jurisdiction for the purpose, and shall be installed in dedicated conduit throughout.

.2 Install main control panel and connect to ac power supply.

.3 Locate and install manual alarm stations and connect to alarm circuit wiring.

.4 Locate and install detectors and connect to alarm circuit wiring. **Do not mount detectors within 1 m (39") of air outlets.** Maintain at least 600 mm (24") radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.

.5 Connect alarm circuits to main control panel.

.6 Locate and install signal devices and connect to signalling circuits.

.7 Connect signalling circuits to main control panel.

.8 Install end-of-line devices at end of applicable alarm and signalling circuits.

.9 Install remote annunciator panels and connect to annunciator circuit wiring.

.10 Locate and install door releasing devices.
Note: Door holders must release by way of local smoke detector and signal from main control panel. Provide additional relays to suit.

.11 **The manufacturer and electrical contractor are to allow in their tender the cost to add five (5) additional signaling devices to be installed and verified in locations as directed by the consultant.**
Note: This installation and verification and subsequent audibility test will be occurring after the initial audibility testing is complete.

.12 Locate and install remote relay units to control fan shut down.

.13 Sprinkler system: wire alarm and supervisory switches and connect to control panel.

.14 Connect fire suppression systems to control panel.

.15 Elevator controllers are to be connected with 4 #14 conductors in conduit from fire alarm control panel to signal elevator recall in the event of a general alarm.

3.2 FIELD QUALITY CONTROL

.1 The new devices be installed and fully tested under the supervision of trained manufacturer’s representative.

3.3 ACCEPTBLE INSTALLER

.1 The fire alarm / life safety system specified herein shall be installed by an Authorized Electrical Contractor who is CFAA certified.

3.4 EXAMINATION

.1 Prior to the commencement of any of the work detailed herein, an examination and analysis of the area(s) where the Fire Alarm / Life Safety System and all associated components are to be installed shall be made.

.2 Any of these area(s) which are found to be outside the manufacturers' recommended environments for the particular specified products shall be noted on a Site Examination Report which shall be given to the Building Owners Representative, and the Consultant.

.3 Any shorts, opens, or grounds found on existing wiring shall be corrected prior to the connection of these wires to any panel component or field device.

3.5 SYSTEM TEST

.1 Perform tests in accordance with General Electrical Requirements Section and CAN/ULC-S537-(latest edition) Standard for the Verification of Fire Alarm Systems.

.2 Fire alarm system:

.1 Test each device and alarm circuit to ensure noted devices transmit alarm to control panel and actuate general alarm and ancillary devices.

.2 Check annunciator panels to ensure zones are shown correctly.

.3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.

.4 Class A circuits.

.1 Test each conductor on all circuits for capability of providing alarm signal on each side of single open-circuit fault condition imposed near middlemost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.2 Test each conductor on all circuits for capability of providing alarm signals during ground-fault condition imposed near middlemost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.5 Class B circuits

.1 Test each conductor on all circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.3 The control panel shall continuously perform as automatic self-test routine on each sensor, which will functionally check the sensor electronics and ensure the accuracy of the valves being transmitted to the control panel.

.4 Automatic testing will occur at a rate of one sensor every four minutes.

.5 The sensor's average analogue value is the average of the last 2000 recorded analogue entries of its chamber.

.6 Any sensor that fails this test shall indicate a '**SELF-TEST ABNORMAL'** trouble condition with the sensor's address at the control panel.

.7 The system shall automatically indicate when an individual sensor needs cleaning. When the sensor's average value reaches a predetermined value, a **'DIRTY SENSOR'** trouble condition shall be audibly and visually indicated at the local control panel for that sensor. IF a **'DIRTY SENSOR'** indication is left unattended and its average value increases to a second predetermined value, an **'EXCESSIVELY DIRTY SENSOR'** trouble condition shall be indicated at the local control panel for that sensor. To prevent false alarms, these **'DIRTY'** conditions shall in no way decrease the amount of smoke obscuration necessary to generate an alarm condition.

.8 An operator having a proper access level, shall have the capability to manually access the following information from the control panel:

.1 Primary Status

.2 Device Type

.3 Present Average Value

.4 Present Sensitivity Selected*

.5 Highest Peak Detection Values (HVP)*

.6 Sensor Range (Normal, Dirty, Excessively Dirty)

* Values shall be in 'percent of smoke obscuration' format so that no interpretation is required by the operator.

3.6 AUDIBILITY TESTING

.1 Audibility Testing:

.1 The contractor is to coordinate an audibility test prior to occupancy of the facility. The test is to be performed by the representatives of the fire alarm manufacturer in the presence of the consultant. The test report is to be in chart form indicating:

.1 Project

.2 Date of test

.3 Room name and number

.4 Ambient dB level

.5 Alarm dB level

.6 Name of testing technician

.2 The test results are to be submitted to the consultant for review prior to issuing to owner's representatives and/or authorities having jurisdiction.

END OF SECTION

EQUIPMENT WIRING SCHEDULE

E=ELECTRICAL
M=MECHANICAL
O=OTHERS

Description			Data			Starter					Control Device						Isolating Device				Remote Items										Interlock		Remarks
Electrical Item	Description	Provided by	Voltage	Size hp/kW/Amps	Phase	Magnetic	Manual	Contactor	Combination	Variable Frequency Drive	Hand/Off/Auto	On/Off Selector	Start/Stop PB.	High/Low/Off	Pilot Light		Disconnect	WP Disconnect	Bkr/Fuse	Starter/Device Wired By	Thermostat	RA Thermostat	Time Clock	Var-Speed Control	Motor Rated Sw. c/w Pilot Light	Dual Voltage Relay	Control Panel	Wired by	Bldg Auto System	Wired by	Interlock To	Interlock By	Description
1	EXHAUST FAN EF-101	M	120	FHP	1												E		E	E													
2	PTAC-1	M	208	15.3 MCA	1												E		E	E	M							E					
3	PTAC-2	M	208	15.3 MCA	1												E		E	E	M							E					
4	AIR COND, UNIT AC-1	M	208	1.0 MCA	1												E		E	E	M												
5	CONDENSING UNIT CU-1	M	208	10.0 MCA	1												E		E	E	M												

LED LIGHT FIXTURE SCHEDULE

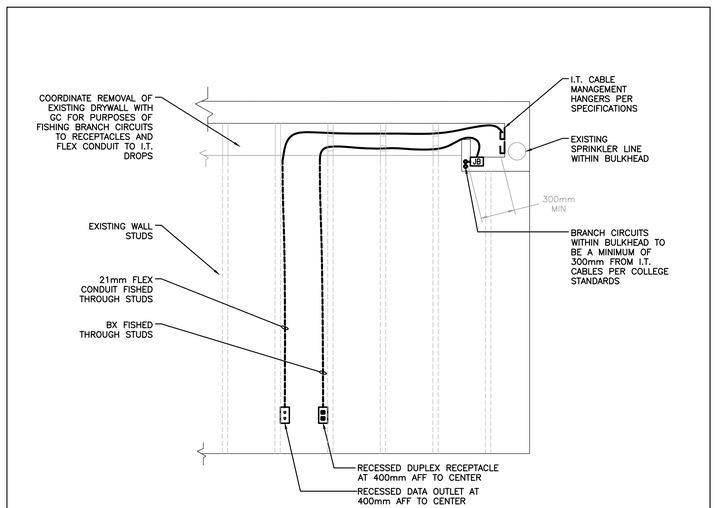
Item	Manufacturer/Catalog Number	Voltage	Lamp	Mounting	Description
L1	COOPER CAT. #S123-DS-1-40-DW-0048-1-D-1-HCD-1-W	120V	LED 2900 LUMENS 4000K 28W	SURFACE	3" WIDE X 4' (75mmX1220mm) LINEAR LED FIXTURE C/W EXTRUDED ALUMINUM HOUSING, SATIN WHITE DIFFUSER LENS, ELECTRONIC DRIVER AND WHITE FINISH
L2	COOPER CAT. #S123-DS-1-40-DW-0096-1-D-1-HCD-1-W	120V	LED 5800 LUMENS 4000K 56W	SURFACE	3" WIDE X 8' (75mmX2440mm) LINEAR LED FIXTURE C/W EXTRUDED ALUMINUM HOUSING, SATIN WHITE DIFFUSER LENS, ELECTRONIC DRIVER AND WHITE FINISH
L3	COOPER CAT. #14SP4240RT C/W SK-14-WT SURFACE MTG. KIT	120V	LED 4397 LUMENS 4000K 42W	SURFACE	1' WIDE X 4' (610mmX1220mm) LED FLAT PANEL FIXTURE C/W WHITE FROST LENS, ELECTRONIC DRIVER AND WHITE FINISH.
EXIT LIGHTS	BEGHELLI CAT. #QRMWLUMWOLR EMERGILITE CAT. #EAXWU LUMACELL CAT. #LAXWU STANPRO CAT. #RMXLOWHUDC AIMLITE CAT. #RPALUMWHTUNVDC READY-LITE CAT. #RA-W-U	12V/120V	LED 2.5 WATT (MAX.)AC 2 WATT (MAX.)DC	SURFACE	LED EXTRUDED ALUMINUM PICTOGRAM FIXTURE C/W GREEN FACE AND WHITE LEGEND, UNIVERSAL MOUNTING TO SUIT WALL, END OR CEILING AND MAXIMUM 63mm (2.5") THICKNESS.
EMERG. LIGHTS	BEGHELLI CAT. #SR-1QLED & SR-2QLED LUMACELL CAT. #MQM1LD7 & MQM2LD7 EMERGILITE CAT. #EF10LG & EF100LG STANPRO CAT. #N112V4WLJ & N213V4WLJ AIMLITE CAT. #RMSM1124WLJWHT & RMSM2124WLJWHT READY-LITE CAT. #R-M-1-LD7 & R-M-2-LD7	12V	LED 4W MR16	SURFACE	LED FIXTURE C/W COMPACT DESIGN WITH VARIABLE LIGHT PATTERN, WHITE COLOUR AND 360° ROTATION.
EMERG. BATT.	BEGHELLI NV12 SERIES: EM-1 #NV12-36/2SR EMERGILITE CAT. #12LSE SERIES LUMACELL CAT. #RGS SERIES STANPRO CAT. #SLA-12 SERIES AIMLITE CAT. #EBST12 SERIES READY-LITE CAT. #LD12X SERIES	12V/120V	N/A	SURFACE	LONG LIFE, SEALED BATTERY, C/W MICRO SIZE 12V 4W (MINIMUM) LED HEADS.

NOTES:
1. FOR INFORMATION REGARDING EQUAL MANUFACTURERS AND LENS INFORMATION REFER TO SPECIFICATION.
2. LED LUMEN VALUES QUOTED FOR FIXTURES ARE TO BE CONSIDERED MINIMUM, AND AS ABSOLUTE OR DELIVERED LUMENS. LUMEN VALUES SHOULD NOT EXCEED MORE THAN 10% OF SPECIFIED OUTPUT.

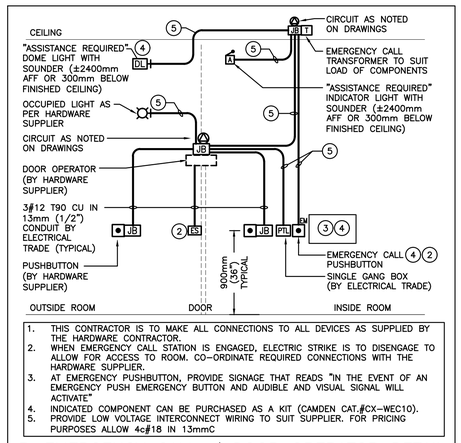
ELECTRICAL SYMBOLS

NOTE: ALL SYMBOLS MAY NOT BE USED

LIGHTING		POWER	
X	LIGHT FIXTURE TYPE AS INDICATED		WALL MOUNTED RECEPTACLE (15A-120V)
	LIGHT FIXTURE (HATCHING DENOTES NIGHTLIGHT)		WALL MOUNTED T-SLOT RECEPTACLE (20A-120V)
	COMBINATION EMERGENCY/EXIT TYPE AS INDICATED		T-SLOT RECEPTACLE MTD. ABOVE COUNTER (20A-120V)
	CEILING OR WALL MOUNTED LIGHT FIXTURE TYPE AS INDICATED	S	RECEPTACLE MTD. ABOVE COUNTER S=SPLIT (15A-120V)
	WALL MOUNTED EXIT LIGHT SHADING INDICATES FACE	ST	STOVE RECEPTACLE
	CEILING MOUNTED EXIT LIGHT ARROWS DENOTE DIRECTION SHADING INDICATES FACE		SPECIAL RECEPTACLE
	SINGLE OR TWIN EMERGENCY LIGHTING FIXTURE		QUAD RECEPTACLE
	RECESSED REMOTE EMERGENCY FIXTURES		DIRECT CONNECTION
EM-X DC-X X-X	BATTERY UNIT WITH INTEGRAL EMERGENCY FIXTURE (EM-X INDICATES BATTERY UNIT TYPE, DC-X INDICATES DC CIRCUIT, AND X-X INDICATES AC SOURCE CIRCUIT		FLOOR BOX C/W DEVICES AS NOTED (REFER TO SPECIFICATIONS)
		JB	JUNCTION BOX
$	SINGLE POLE SWITCH (3=3 WAY, 4=4 WAY, P=PILOT LIGHT, K=KEYED, DM=DIMMER, M=MOTOR RATED)	PB	PULLBOX
$^{OS}	OCCUPANCY SENSOR (PASSIVE)		PANEL AS INDICATED
OSD/OSR $	OCCUPANCY SENSOR: OSD=DUAL TECHNOLOGY OSR=DUAL CIRCUIT/DUAL TECHNOLOGY		FUSED DISCONNECT
			UNFUSED DISCONNECT
FIRE ALARM			DUAL VOLTAGE RELAY
	HEAT DETECTOR (135 DEGREE RATE OF RISE AND FIXED TEMPERATURE)		CLOCK AS PER SPECIFICATION
	HEAT DETECTOR (135 DEGREE FIXED TEMPERATURE)		TIME SWITCH
	HEAT DETECTOR (194 DEGREE FIXED TEMPERATURE)		0-15 MINUTE INTERVAL TIMER LEVITON DECORA PLUS CAT.#6215M
	HEAT DETECTOR (195 DEGREE RATE OF RISE AND FIXED TEMPERATURE)	S	SPEED CONTROLLER
S	SMOKE DETECTOR (RL=RELAY BASE)		MANUAL STARTER
	PULLSTATION		MAGNETIC STARTER
	ALARM BELL (A, B = SIGNAL CIRCUIT)		COMBINATION MAGNETIC STARTER
	ALARM HORN (A, B = SIGNAL CIRCUIT)		SURFACE RACEWAY C/W DEVICES AS NOTED (REFER TO SPECIFICATION
	ALARM STROBE (A, B = SIGNAL CIRCUIT)	HD	HAND DRYER
	COMBINATION HORN/STROBE (A, B = SIGNAL CIRCUIT)		PUSH-BUTTON STATION
		C	CONTACTOR
COMMUNICATIONS			EXHAUST FAN
	SINGLE TELEPHONE OUTLET UNLESS OTHERWISE NOTED C/W 3/4" (21mm) C NEAREST CABLE MANAGEMENT	PP	POWER POLE
	SINGLE COMPUTER OUTLET UNLESS OTHERWISE NOTED C/W 3/4" (21mm) C TO NEAREST CABLE MANAGEMENT		
1/1	COMBINATION SINGLE VOIP/ SINGLE DATA OUTLET UNLESS OTHERWISE NOTED C/W 3/4" (21mm) C TO NEAREST CABLE MANAGEMENT	SECURITY	
			SECURITY DETECTOR (SURFACE MOUNTED) #
TV	TELEVISION OUTLET C/W 1"C (27mm) TO NEAREST CORRIDOR CEILING SPACE.	KP	SECURITY KEYPAD
	CEILING MOUNTED SPEAKER	DC	DOOR CONTACT C/W 19mmC TO NEAREST SECURITY JUNCTION BOX
	HORN SPEAKER	CR	CARD READER ROUGHIN AS A SINGLE GANG BOX AT 1200mm AFF C/W 13mmC TO ELECTRIC STRIKE IN ADJACENT DOOR FRAME. CONFIRM ROUGHIN WITH DOOR HARDWARE.
ELECTRIC HEAT		ES	ELECTRIC STRIKE. CONFIRM ROUGHIN WITH DOOR HARDWARE.
X	BASEBOARD ELECTRIC HEATER (TYPE AS INDICATED)	GENERAL	
X	FAN FORCED ELECTRIC HEATER (TYPE AS INDICATED)	ER	INDICATED EXISTING ITEM TO REMAIN
		D	INDICATES EXISTING ITEM TO BE DELETED
		R	INDICATES EXISTING ITEM TO BE RELOCATED/IN RELOCATED POSITION
		WG	WIREGUARD
		GF	GROUND FAULT
		WP	WEATHERPROOF
		TR	TAMPER RESISTANT
		X	NOTE INDICATOR
		X	MECHANICAL ITEM NO.



A-OFFICE CABLE MANAGEMENT COVE
SCALE: NTS



1. THIS CONTRACTOR IS TO MAKE ALL CONNECTIONS TO ALL DEVICES AS SUPPLIED BY THE HARDWARE CONTRACTOR.
2. WHEN EMERGENCY CALL STATION IS ENGAGED, ELECTRIC STRIKE IS TO DISENGAGE TO ALLOW FOR ACCESS TO ROOM. CO-ORDINATE REQUIRED CONNECTIONS WITH THE HARDWARE SUPPLIER.
3. AT EMERGENCY PUSHBUTTON, PROVIDE SIGNAGE THAT READS "IN THE EVENT OF AN EMERGENCY PUSH EMERGENCY BUTTON AND AUDIBLE AND VISUAL SIGNAL WILL ACTIVATE"
4. INDICATED COMPONENT CAN BE PURCHASED AS A KIT (CAMDEN CAT.#CX-WEC10).
5. PROVIDE LOW VOLTAGE INTERCONNECT WIRING TO SUIT SUPPLIER. FOR PRICING PURPOSES ALLOW 4c#18 IN 13mmC

B-EMERGENCY CALL / DOOR OPERATOR DETAIL
SCALE: NTS

The contractor shall verify all dimensions and report all errors and discrepancies to the Consultant before commencement of the work.
The drawings show general arrangement of services. Follow as closely as actual building construction will permit. Obtain approval for relocation of service from Consultant before commencement of the work.
The drawings do not indicate all offsets fitting and accessories which may be required. Provide the same to meet the required conditions.
Drawings and specifications, etc., prepared and issued by the consultant are the property of the consultant and must be returned at the completion of the project. These documents are not to be duplicated or copied without the consent of the Consultant.
Do not scale this drawing.

DEI Consulting Engineers
MECHANICAL | ELECTRICAL | AQUATIC
55 Northland Road, Waterloo, ON, N2V 1Y8
Phone: 519-725-3555
Fax: 519-725-2525
Website: deiassociates.ca
Project Number: 18299

DATE	REVISIONS
DEC 19/18	ADDENDUM 1
DEC 12/18	ISSUED FOR TENDER
DEC 10/18	ISSUED FOR REVIEW

SIMCOE VILLAGE RENOVATIONS PHASE 2 2019
1090 SIMCOE STREET NORTH OSHAWA, ONTARIO

DURHAM COLLEGE SUCCESS MATTERS

DRAWING
LEGEND, SCHEDULES AND DETAILS

TRUE NORTH | DWG. NORTH
JOB NO. 1910
SCALE AS NOTED
DATE DECEMBER 2018
PRINTED
DWG. NO. **E1.1**

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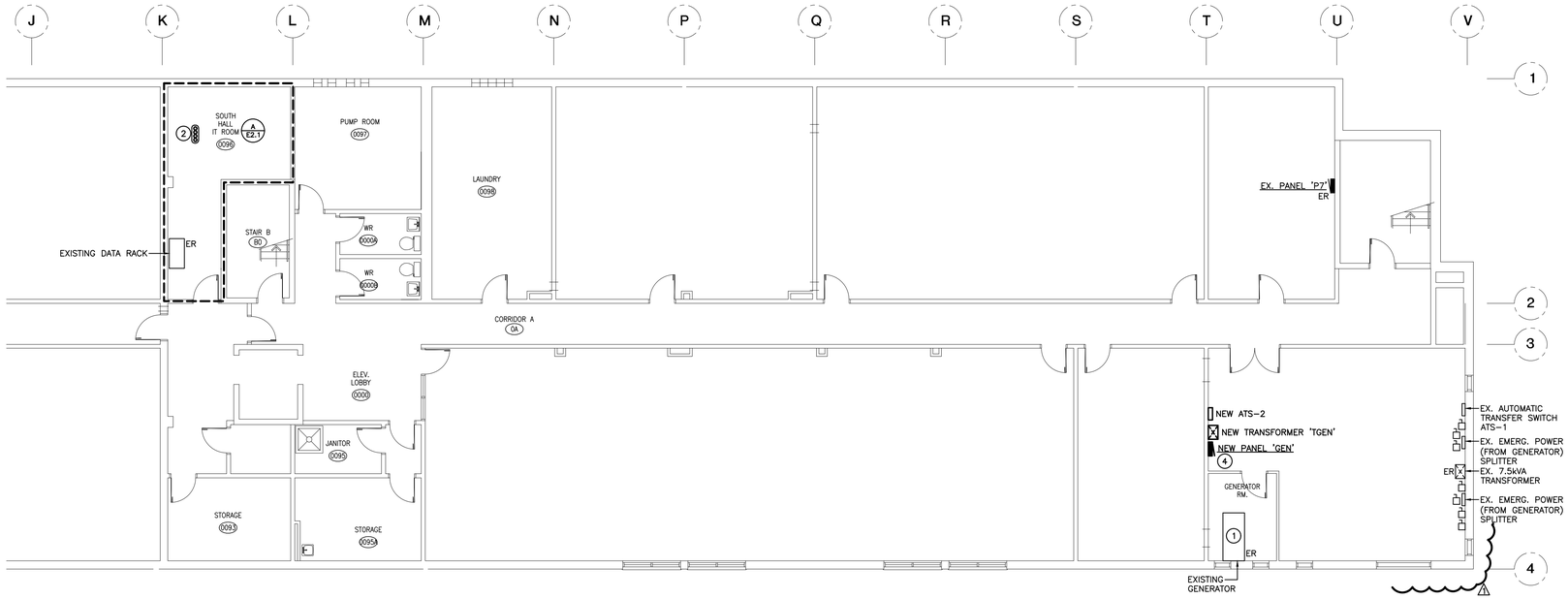
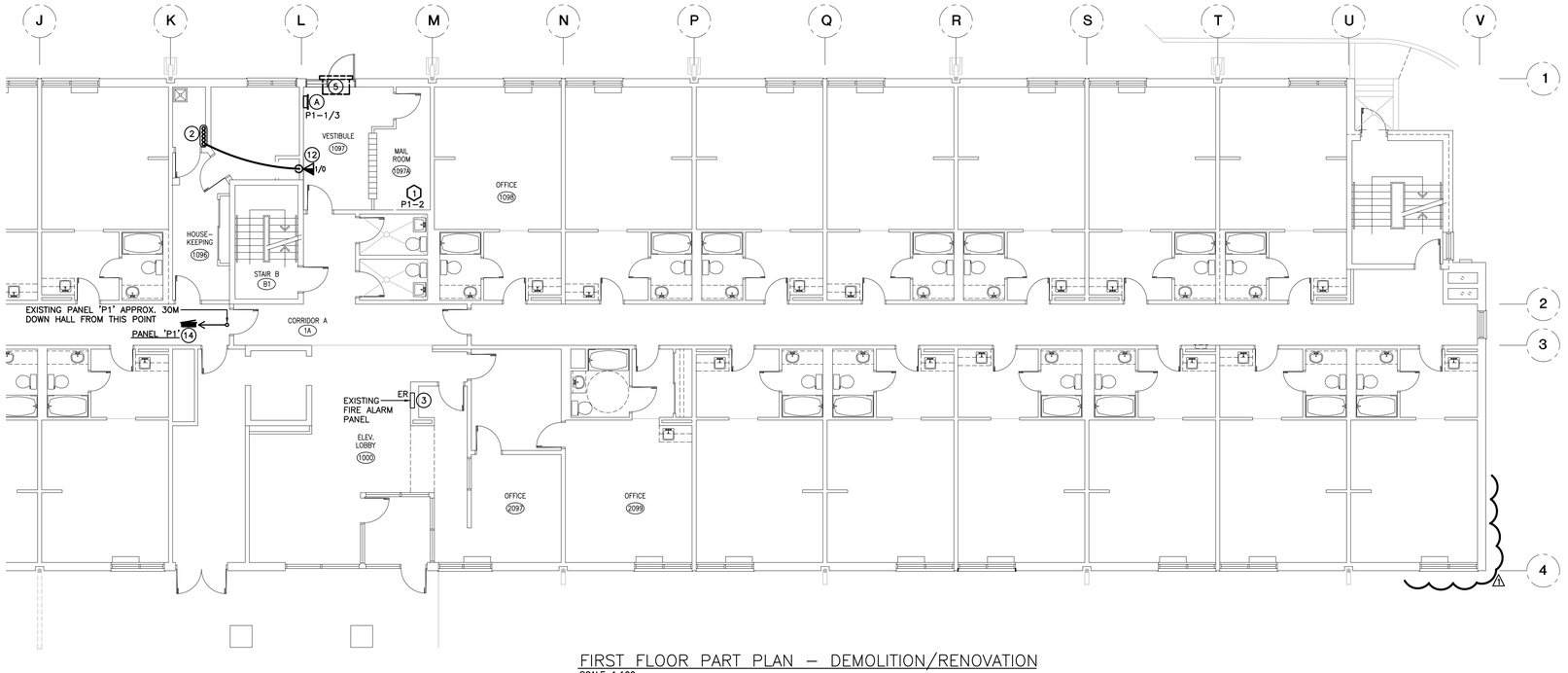


BASEMENT PART PLANS – DEMOLITION/RENOVATION
SCALE: 1:100



FIRST FLOOR PART PLAN – DEMOLITION/RENOVATION
SCALE: 1:100

GENERAL RENOVATION NOTES

- 'ER' INDICATES EXISTING ITEM TO REMAIN.
- 'R' INDICATES EXISTING ITEM IN RELOCATED POSITION.
- ALL DEVICES SHOWN ARE NEW UNLESS OTHERWISE NOTED.
- EXISTING ELECTRICAL EQUIPMENT NOT SHOWN SHALL REMAIN UNLESS OTHERWISE NOTED.
- MAINTAIN SERVICE TO ALL EXISTING DEVICES TO REMAIN.
- REVISE PANEL DIRECTORIES TO SUIT CHANGES (TYPED).

SPECIFIC RENOVATION NOTES

1 INDICATES LOCATION OF EXISTING GENSET (17.5kVA, 600V. 3PH).

2 INDICATES PROPOSED ROUTING OF NEW GENERATOR BRANCH CIRCUITS AND TELECOMM RISER CONDUITS WITHIN SERVICE ROOM FROM BASEMENT LAN ROOM AND UP TO 2ND FLOOR.

3 INDICATES LOCATION OF EXISTING FIRE ALARM CONTROL PANEL (EDWARDS EST3).

4 INDICATES PROPOSED LOCATION OF NEW GENERATOR BACKED BRANCH CIRCUIT PANEL "GEN".

5 INDICATES EXISTING INCREMENTAL UNIT BEING REMOVED BY DIV. 15. THIS CONTRACTOR IS TO DISCONNECT AND REMOVE FEEDER BACK TO SOURCE. DISCONNECT AND REMOVE ALL CONTROL DEVICES. LABEL SOURCE BREAKER AS SPARE.

6 INDICATES PROPOSED LOCATION OF NEW TELECOMMUNICATIONS RACK IN EXISTING I.T. ROOM RACK TO BE PROVIDED AND INSTALLED BY THE COMMUNICATIONS CABLING CONTRACTOR PER SPECIFICATION SECTION 27 31 40.1.

7 INDICATES TRAPEZE MOUNT CABLE MANAGEMENT TRAY ABOVE NEW TELECOMMUNICATIONS RACK PER SPECIFICATIONS SECTION 27 31 40.1. ANCHOR TO END WALL. MOUNT TRAY APPROX. 300mm BELOW FINISHED CEILING BUT NOT MORE THAN 450mm ABOVE NEW DATA RACK.

8 PROVIDE GROUNDING OF ALL NEW CABLE TRAY, CONDUIT STUBS AND EQUIPMENT RACKS WITHIN I.T. ROOM PER SPECIFICATIONS. ALL CURRENT CARRYING COMPONENTS OF NOTED ELEMENTS NOTED TO BE CONNECTED TO EXISTING TELECOMMUNICATIONS GROUND BUS WITHIN I.T. ROOM UTILIZING #6 CU INSULATED GREEN GROUND CONDUCTOR.

9 INDICATES NEW L5-30R RECEPTACLE MOUNTED TO PLYWOOD BACKBOARD BEHIND NEW RACK. CONFIRM RECEPTACLE CONFIGURATION WITH COLLEGE I.T. PROVISION OF NEW UPS UNIT.

10 INDICATES 2440mmH X 1220mmW X 21mm PAINTED PLYWOOD TELECOMMUNICATIONS BACKBOARD MOUNTED ON WALL BEHIND NEW RACK PER SPECIFICATIONS.

11 INDICATES EXISTING I.T. ROOM DATA RACK UPS OUTLET (2000VA) TO BE FED FROM NEW GENERATOR TRANSFER SWITCH BACKED PANEL "GEN" AS NOTED.

12 INDICATES SINGLE GANG SURFACE BOX (EQUAL TO WIREMOLD NMW3) WITH SINGLE VOIP DROP MOUNTED AT 1200mm AFF (OWNER WILL PROVIDE PHONE), FROM BOX RUN SURFACE NON-METALLIC WIREMOLD RACEWAY (EQUAL TO WIREMOLD 400 SERIES) UP WALL TO CEILING SPACE. RUN 1"C OVER TO SERVICE ROOM RISER CONDUITS AND RUN DOWN TO BASEMENT I.T. ROOM #0096.

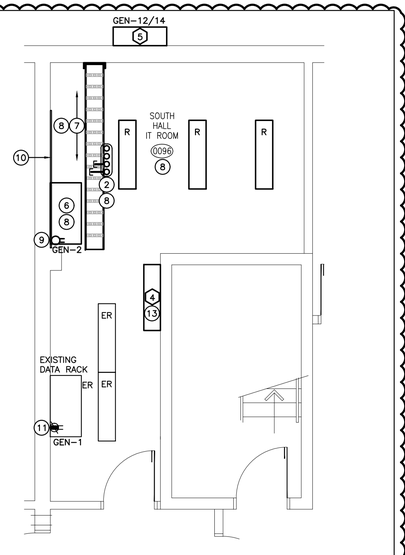
13 INDICATES AC UNIT FED FROM ASSOCIATED CONDENSING UNIT.

14 INDICATES EXISTING 120/208V 3PH 4W 400A RECESSED PANEL. AT AVAILABLE SPACES PROVIDE ONE 20A-2P BREAKER AND LABEL AS "VESTIBULE 1097 3kW HEATER" AND PROVIDE ONE 15A-1P BREAKER AND LABEL AS "MAIL ROOM 1097A EXHAUST FAN EF-101". PROVIDE NEW TYPEWRITTEN PANEL DIRECTORY.

HEATER SCHEDULE

FOR INFORMATION REGARDING EQUAL MANUFACTURERS REFER TO SPECIFICATION.

Item	Manufacturer/Catalog Number
A	3000 WATT 208 VOLT SINGLE PHASE FAN FORCED HEATER C/W SURFACE MOUNTING BOX, INTEGRAL TAMPERPROOF THERMOSTAT AND STANDARD FACTORY FINISH (WHITE OR ALMOND) TO SUIT ARCHITECT. OUELLET CAT. #OAC04000-T-KIT-OAC-BS1



A-ENLARGED SOUTH HALL IT ROOM #0096 PLAN
SCALE: 1:50

The contractor shall verify all dimensions and report all errors and discrepancies to the Consultant before commencement of the work.
The drawings show general arrangement of services. Follow as closely as actual building construction will permit. Obtain approval for relocation of service from Consultant before commencement of the work.
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Project Number: 18299

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SIMCOE VILLAGE RENOVATIONS PHASE 2 2019
1090 SIMCOE STREET NORTH OSHAWA, ONTARIO

DURHAM COLLEGE SUCCESS MATTERS

DRAWING
BASEMENT AND FIRST FLOOR DEMOLITION AND RENOVATION PART PLANS

TRUE NORTH | DWG. NORTH

JOB NO. 1910

SCALE AS NOTED

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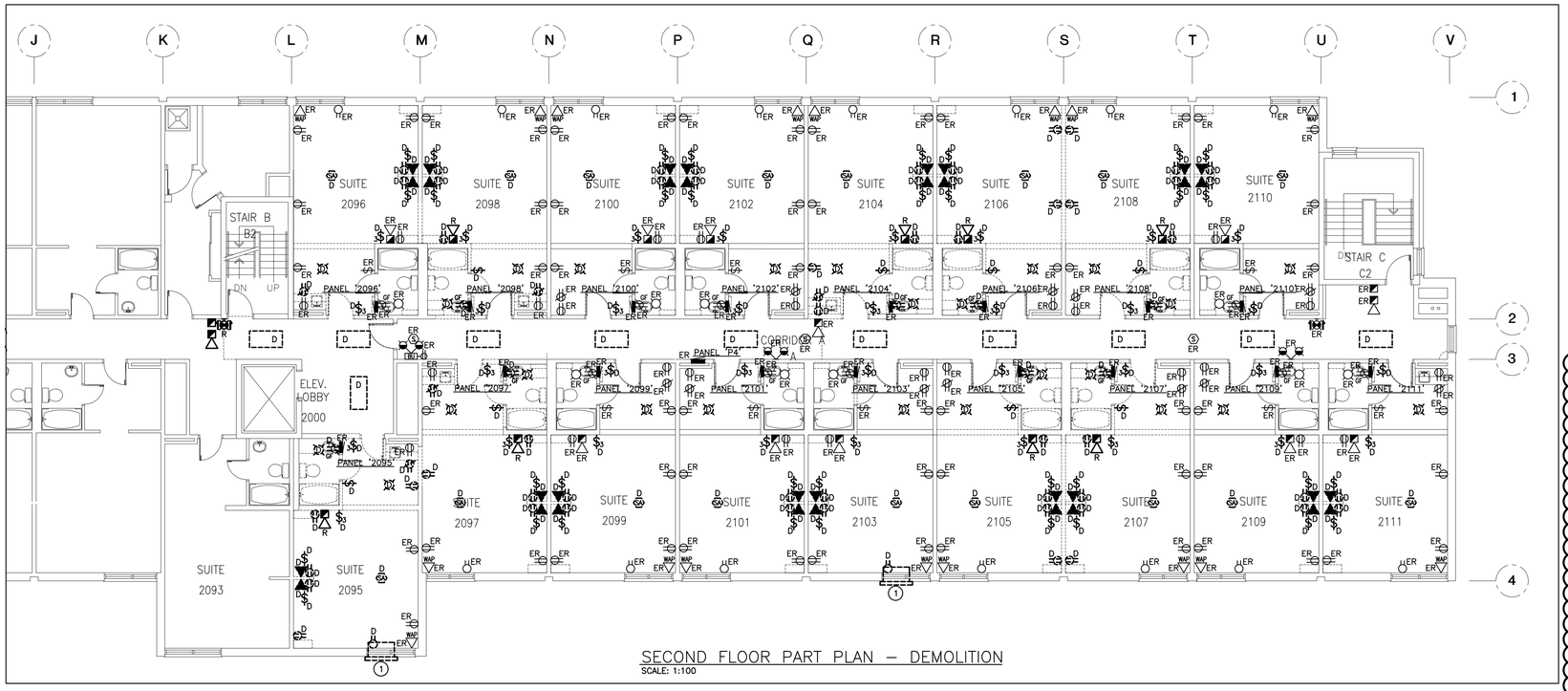


SECOND FLOOR PART PLAN – DEMOLITION

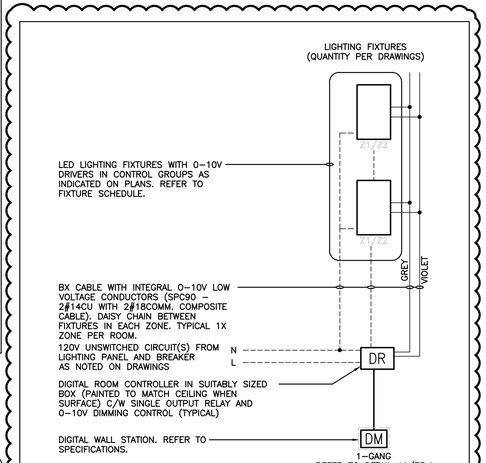
SCALE: 1:100

GENERAL DEMOLITION NOTES

- 'ER' DENOTES EXISTING ITEM TO REMAIN.
- EXISTING ELECTRICAL EQUIPMENT NOT SHOWN SHALL REMAIN UNLESS NOTED OTHERWISE.
- 'R' INDICATES EXISTING ITEM TO BE RELOCATED. REFER TO RENOVATION DRAWINGS AND RELOCATE DEVICE AND WIRING TO SUIT. UNLESS OTHERWISE NOTED.
- 'D' INDICATES EXISTING ITEM TO BE DELETED. UNLESS OTHERWISE NOTED DISCONNECT AND REMOVE NOTED DEVICE AND WIRING BACK TO SOURCE.
- ALL LIGHTING FIXTURES BEING RELOCATED SHALL BE CLEANED AND CHECKED PRIOR TO BEING REINSTALLED.

SPECIFIC DEMOLITION NOTES

1 INDICATES EXISTING INCREMENTAL UNIT BEING REMOVED BY DIV. 15. THIS CONTRACTOR IS TO DISCONNECT AND REMOVE ASSOCIATED RECEPTACLE AND MAINTAIN WIRING FOR RECONNECTION TO NEW HARDWIRED REPLACEMENT UNIT (REFER TO RENOVATION PLAN).



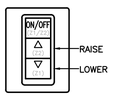
NOTES:

1–LIGHTING CONTROLS SHALL BE PROGRAMMED WITH MANUAL ON, MANUAL OFF

2–USER ADJUSTS LIGHTING LEVEL VIA WALL STATION DIMMER

A–TYPICAL OFFICE LIGHTING CONTROL

SCALE: N.T.S.

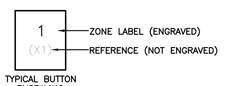


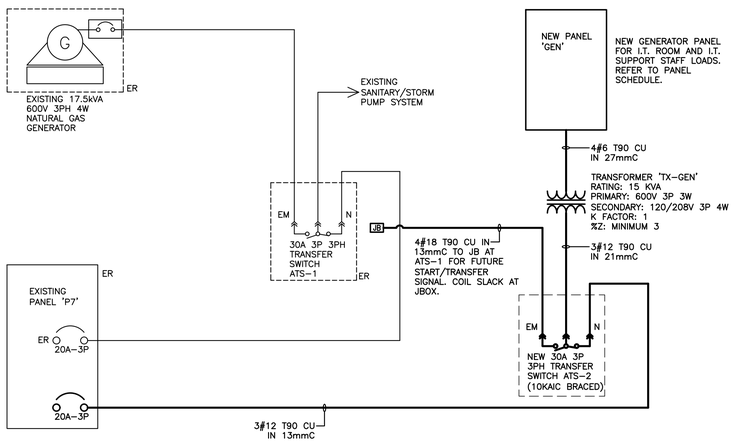
A1–TYPICAL OFFICE BUTTON CONFIGURATION

SCALE: N.T.S.

NOTES:

1. REFER TO LIGHTING PLANS FOR GROUPINGS.
2. WALL STATION BUTTONS TO BE ENGRAVED WITH LABELS ACCORDING TO LEVEL AS NOTED. COORDINATE LABELS WITH SCHOOL BOARD REPRESENTATIVE. PROVIDE BUTTON ENGRAVING WORKSHEET WITH SHOP DRAWING SUBMISSION FOR REVIEW. WORKSHEETS TO BE COMPLETED FOR EACH CONTROL STATION GROUP. USE SINGLE MULTI–GANG FACEPLATE, FINISH PER SPECIFICATIONS.
3. REFER TO SPECIFICATIONS FOR INFORMATION REGARDING PROGRAMMING OF INPUT DEVICES AND DIGITAL WALL STATIONS PER ROOM TYPE.





DISTRIBUTION RISER AUTOMATIC TRANSFER SWITCH

SCALE: NTS

NOTES

1 EXISTING NATURAL GAS GENSET, AUTOMATIC TRANSFER SWITCH AND SANITARY/STORM SYSTEM CONNECTIONS TO REMAIN.

2 PROVIDE NEW AUTOMATIC TRANSFER SWITH ATS–2 C/W NORMAL POWER CONNECTION FROM EXISTING BRANCH CIRCUIT PANEL 'P7' AS NOTED. CONNECT OUTPUT TO NEW STEPDOWN TRANSFORMER AND PANEL "GEN". GENERATOR POWER CONNECTION TO REMAIN UNCONNECTED PENDING FUTURE GENERATOR UPGRADE.

3 PROVIDE CONTROL WIRING IN CONDUIT TO JUNCTION BOX AT EXISTING TRANSFER SWITCH AS NOTED FOR FUTURE CONTROL CIRCUIT.

PANEL 'GEN'

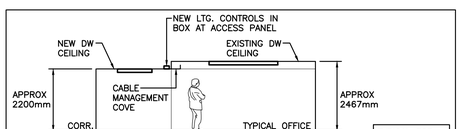
VOLTAGE: 120/208 VOLTS
PHASE: 3P, 4W
MAINS: 100A
NEUTRAL BUS: FULL
MOUNTING: SURFACE
NOTES: C/W SPRINKLER HOOD

* INDICATES 33mA GROUND FAULT STYLE BREAKER

THE CONTRACTOR IS TO COORDINATE ROOM NAMES AND NUMBERS NOTED WITH THE FINAL ROOM INFORMATION ISSUED DURING CONSTRUCTION AND ADJUST DIRECTORIES TO SUIT.

SOUTH HALL IT RM. EX. RACK REC.	20A	1	2	30A	SOUTH HALL IT RM. NEW RACK REC.	
SPARE	15A	3	4	15A	SPARE	
OFFICE 2108 DESK REC.	15A	5	6	15A	OFFICE 2108 DESK REC.	
OFFICE 2108 DESK REC.	15A	7	8	15A	OFFICE 2108 DESK REC.	
OFFICE 2107 DESK REC.	15A	9	10	15A	OFFICE 2107 DESK REC.	
OFFICE 2107 DESK REC.	15A	11	12	15A	CONDENSING UNIT CU–1	
SPARE	20A	13	14	2P	(5)	
SPARE	15A	15	16	15A	SPARE	
SPARE	15A	17	18	15A	SPARE	
SPARE	15A	19	20	15A	SPARE	
SPACE		21	22		SPACE	
SPACE		23	24		SPACE	
SPACE		25	26		SPACE	
SPACE		27	28		SPACE	
SPACE		29	30		SPACE	
SPACE		31	32		SPACE	
SPACE		33	34		SPACE	
SPACE		35	36		SPACE	
SPACE		37	38		SPACE	
SPACE		39	40		SPACE	
SPACE		41	42		SPACE	

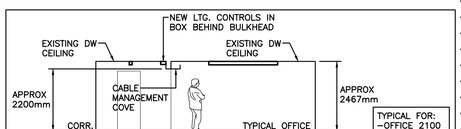
NOTE: THE INDICATED PANEL ASSEMBLY MUST HAVE AN INTERRUPTING CAPACITY OF 10000A . PROVIDE BY EITHER FULLY RATED BREAKERS OR INTEGRATED EQUIPMENT RATING WITH THE UPSTREAM BREAKER.



TYPICAL FOR:
–MEETING 2095
–OFFICE 2096
–OFFICE 2098
–TESTING 2104
–OFFICE 2107
–OFFICE 2108

B–TYPICAL OFFICE LIGHTING ELEVATION

SCALE: 1:100



TYPICAL FOR:
–OFFICE 2100
–OFFICE 2101
–OFFICE 2102
–OFFICE 2103
–OFFICE 2105
–OFFICE 2109
–OFFICE 2110
–OFFICE 2111

C–TYPICAL OFFICE LIGHTING ELEVATION

SCALE: 1:100

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DRAWING
SECOND FLOOR DEMOLITION PART PLAN, RISER AND DETAILS

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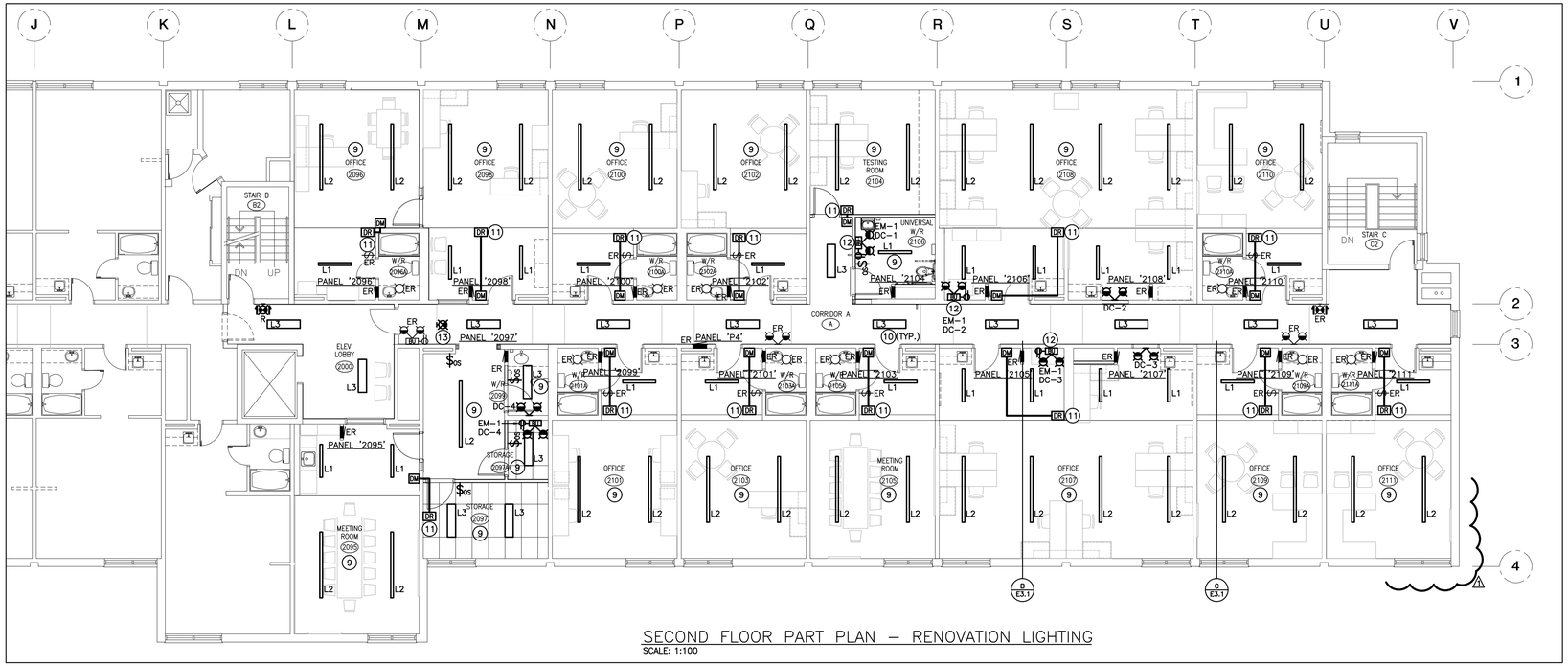
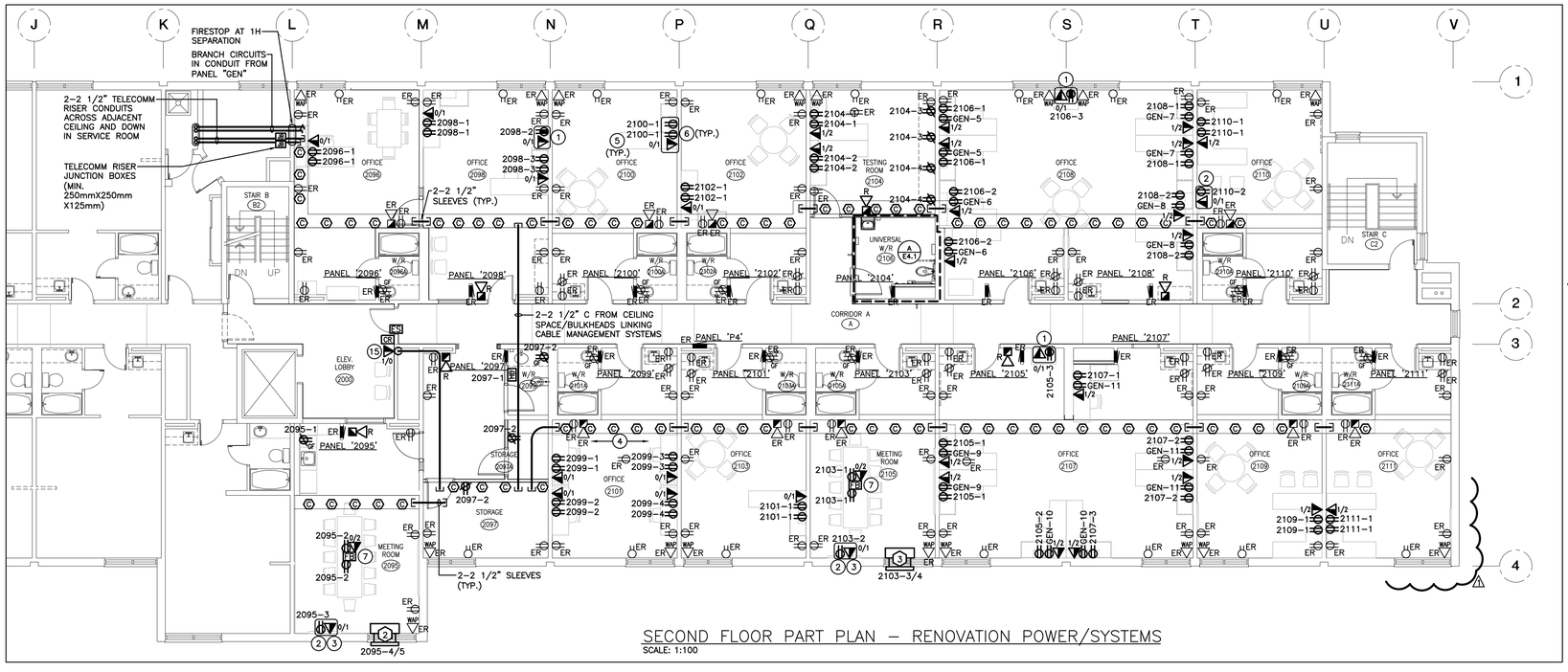


SECOND FLOOR PART PLAN – RENOVATION LIGHTING

SCALE: 1:100



SECOND FLOOR PART PLAN – RENOVATION POWER/SYSTEMS

SCALE: 1:100

GENERAL RENOVATION NOTES

- 'ER' INDICATES EXISTING ITEM TO REMAIN.
- 'R' INDICATES EXISTING ITEM IN RELOCATED POSITION.
- ALL DEVICES SHOWN ARE NEW UNLESS OTHERWISE NOTED.
- EXISTING ELECTRICAL EQUIPMENT NOT SHOWN SHALL REMAIN UNLESS OTHERWISE NOTED.
- MAINTAIN SERVICE TO ALL EXISTING DEVICES TO REMAIN.
- REVISE PANEL DIRECTORIES TO SUIT CHANGES (TYPED).

SPECIFIC RENOVATION NOTES

1 INDICATES DEVICES FOR OWNER'S PRINTER. CONFIRM EXACT LOCATION/MOUNTING HEIGHT ON SITE WITH OWNER PRIOR TO ROUGH–IN.

2 INDICATES DEVICES FOR OWNER'S T.V. MONITOR. CONFIRM EXACT LOCATION/MOUNTING HEIGHT ON SITE WITH OWNER PRIOR TO ROUGH–IN.

3 INDICATES NEW DEVICE TO BE FISHED INTO EXISTING PARTITION. IF WALL CANNOT BE FISHED PROVIDE RUN OF SURFACE RACEWAY (V700 FOR POWER VXXX FOR TELECOM).

4 INDICATES CABLE MANAGEMENT SYSTEM AT EXISTING FINISHED CEILINGS/SPRINKLER BULKHEAD. REFER TO DETAIL A/E1.1. PROVIDE 2–2 1" CONDUIT SLEEVES THROUGH PARTITIONS BETWEEN EACH ADJACENT ROOM.\

5 INDICATES TYPICAL WORKSTATION FED FROM GENERATOR BACKED PANEL "GEN". RECEPTACLES ON GENERATOR POWER TO BE GRAY IN COLOUR.

6 INDICATES NEW OFFICE RECEPTACLE AND TELECOM OUTLET TO BE FISHED INTO EXISTING PARTITION FROM CABLE MANAGEMENT BULKHEAD, REFER TO DETAIL A/E1.1.

7 INDICATES FLOOR BOX PER SPECIFICATIONS CUT INTO EXISTING FLOOR ASSEMBLY. ORIENT BOX TO SUIT JOIST CONFIGURATION AS CLOSE TO THE CENTRE OF MEETING ROOM TABLE AS POSSIBLE. PROVIDE BRANCH CIRCUIT CABLING AND 2 X 3/4" TELECOM CONDUITS FROM NEARBY PARTITION TO SUIT JOIST ORIENTATION.

8 INDICATES NEW FIRE ALARM SIGNAL DEVICE ON NEW STROBE CIRCUIT TO SUIT REQUIREMENTS OF UNIVERSAL WASHROOM.

9 INDICATES LIGHTING FIXTURES WITHIN ROOM TO BE CONNECTED TO EXISTING LIGHTING BRANCH CIRCUIT AND NEW CONTROLS AS NOTED.

10 INDICATES NEW CORRIDOR FIXTURES IN PLACE OF EXISTING. CONNECT TO EXISTING LIGHTING BRANCH CIRCUIT AND CONTROLS.

11 INDICATES DIGITAL LIGHTING ROOM CONTROLLER AND WALL STATION DIMMER FOR CONTROL OF NEW LIGHTING FIXTURES WITHIN RESPECTIVE SPACE. MOUNT IN ACCESSIBLE LOCATION. REFER TO LIGHTING CONTROL DETAILS.

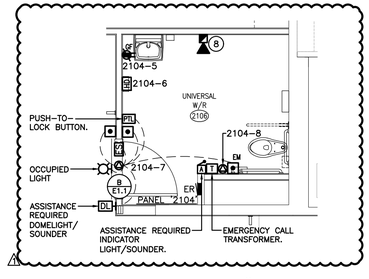
12 CONNECT BATTERY UNIT TO UNSWITCHED SIDE OF LIGHTING BRANCH CIRCUIT IN AREA SERVED.

13 CONNECT INDICATED DEVICE TO LINE SIDE OF EXISTING CORRIDOR LIGHTING CIRCUIT AND LOCAL EXISTING BATTERY UNIT.

14 EXISTING LOCAL PANELS (WESTINGHOUSE #WL1212) TO BE USED TO FEED DEVICES WITHIN EACH ROOM. CIRCUIT NUMBERS NOTED ARE FOR CONFIGURATION PURPOSES ONLY AND MAY NOT BE THE EXACT CIRCUIT NUMBERS THAT ARE AVAILABLE. PROVIDE UPDATED TYPEWRITTEN PANEL DIRECTORIES FOR EACH PANEL SHOWING EXISTING AND NEW CIRCUITS.

PANEL	CIRCUIT	NEW	BREAKER	DESCRIPTION
2095	2095–1		15A–1P	MEETING ROOM 2095 COUNTER RECEPTACLE
2095	2095–2		15A–1P	MEETING ROOM 2095 FLOOR BOX RECEPTACLE
2095	2095–3		15A–1P	MEETING ROOM 2095 MONITOR RECEPTACLE
2095	2095–4/5		20A–2P	MEETING ROOM 2095 PTAC–1(2)
2096	2096–1		15A–1P	OFFICE 2096 DESK RECEPTACLE
2097	2097–1		20A–1P	WASHROOM 2099 HAND DRYER
2097	2097–2		15A–1P	WR 2099/STORAGE 2097 & 2097A RECEPTACLES
2098	2098–1		15A–1P	OFFICE 2098 DESK RECEPTACLE
2098	2098–2		20A–1P	OFFICE 2098 PRINTER RECEPTACLE
2098	2098–3		15A–1P	OFFICE 2098 DESK RECEPTACLE
2099	2099–1		15A–1P	OFFICE 2101 DESK RECEPTACLE
2099	2099–2		15A–1P	OFFICE 2101 DESK RECEPTACLE
2099	2099–3		15A–1P	OFFICE 2101 DESK RECEPTACLE
2099	2099–4		15A–1P	OFFICE 2101 DESK RECEPTACLE
2100	2100–1		15A–1P	OFFICE 2100 DESK RECEPTACLE
2101	2101–1		15A–1P	OFFICE 2103 DESK RECEPTACLE
2102	2102–1		15A–1P	OFFICE 2102 DESK RECEPTACLE
2103	2103–1		15A–1P	MEETING 2105 FLOOR BOX RECEPTACLE
2103	2103–2		15A–1P	MEETING 2105 MONITOR RECEPTACLE
2103	2103–3/4		20A–2P	MEETING 2105 PTAC–2(3)
2104	2104–1		15A–1P	TESTING 2104 DESK RECEPTACLE
2104	2104–2		15A–1P	TESTING 2104 DESK RECEPTACLE
2104	2104–3		15A–1P	TESTING 2104 COUNTER RECEPTACLE
2104	2104–4		15A–1P	TESTING 2104 COUNTER RECEPTACLE
2104	2104–5		20A–1P	UNIVERSAL WR 2106 RECEPTACLE
2104	2104–6		20A–1P	UNIVERSAL WR 2106 HAND DRYER
2104	2104–7		15A–1P	UNIVERSAL WR 2106 DOOR OPERATOR
2104	2104–8		15A–1P	UNIVERSAL WR 2106 EMERG. CALL XFMR
2105	2105–1		15A–1P	OFFICE 2107 DESK RECEPTACLE
2105	2105–2		15A–1P	OFFICE 2107 DESK RECEPTACLE
2105	2105–3		20A–1P	OFFICE 2107 PRINTER RECEPTACLE
2106	2106–1		15A–1P	OFFICE 2108 DESK RECEPTACLE
2106	2106–2		15A–1P	OFFICE 2108 DESK RECEPTACLE
2106	2106–3		20A–1P	OFFICE 2108 PRINTER RECEPTACLE
2107	2107–1		15A–1P	OFFICE 2107 DESK RECEPTACLE
2107	2107–2		15A–1P	OFFICE 2107 DESK RECEPTACLE
2107	2107–3		15A–1P	OFFICE 2107 DESK RECEPTACLE
2108	2108–1		15A–1P	OFFICE 2108 DESK RECEPTACLE
2108	2108–2		15A–1P	OFFICE 2108 DESK RECEPTACLE
2109	2109–1		15A–1P	OFFICE 2109 DESK RECEPTACLE
2110	2110–1		15A–1P	OFFICE 2110 DESK RECEPTACLE
2110	2110–2		15A–1P	OFFICE 2110 MONITOR RECEPTACLE
2111	2111–1		15A–1P	OFFICE 2111 DESK RECEPTACLE

15 INDICATES SINGLE GANG SURFACE BOX (EQUAL TO WIREMOLD NMW3) WITH SINGLE VOIP DROP MOUNTED AT 1200mm AFF (OWNER WILL PROVIDE PHONE). FROM BOX RUN SURFACE NON–METALLIC WIREMOLD RACEWAY (EQUAL TO WIREMOLD 400 SERIES) UP WALL TO CEILING SPACE. RUN 1"C OVER TO CABLE MANAGEMENT COVE THEN RUN WIRING IN COVE HANGERS TO SERVICE ROOM RISER CONDUITS AND RUN DOWN TO BASEMENT I.T. ROOM #0096.



A–ENLARGED UNIVERSAL WR #2106 PLAN

SCALE: 1:50

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