

**Electrical
Specifications**
FOR
**Complex Malignant Hematology Consolidation
K Wing, 3rd Floor Centre
Sunnybrook Health Sciences Centre**
2075 Bayview Avenue
Toronto, Ont.
M4N 3M5

Issued for Tender
November 12, 2024

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ELECTRICAL GENERAL REQUIREMENTS

26 05 01

PART - 1 GENERAL REQUIREMENTS

1.1 SCOPE

- .1 This Section covers items common to Sections of Division 26. This section supplements requirements of Division 1.
- .2 Comply with General Conditions of Contract, Supplementary Conditions and Division 01 - General Requirements.
- .3 Where conflict occurs between Codes, Specification and Drawings, plan and riser, the maximum condition to govern, and the Tender to be based on whichever indicates the greater cost.

1.2 WORK INCLUDED

- .1 Work to be done under this section to include furnishing of labour, materials and equipment required for installation, testing and putting into proper operation complete Electrical systems as shown, as specified, as intended, and as otherwise required. Complete systems to be left ready for continuous and efficient satisfactory operation.

1.3 DOCUMENT ORGANIZATION

- .1 Applicable Divisions for Electrical Work:
 - .1 Division 26 - Electrical
 - .2 Division 27 - Communications
 - .3 Division 28 - Electronic Safety and Security
- .2 For clarity, any reference in the Contract Documents to Division 26 includes Division 27 and 28.
- .3 The Specifications for these Divisions are arranged in Sections for convenience. It is not intended to recognize, set or define limits to any subcontract or to restrict Contractor in letting subcontracts.
- .4 Contractor is responsible for completion of work whether or not portions are sublet.

1.4 DIVISION 26, AS IT APPLIES TO DIVISION 27 AND 28

- .1 Articles that are of a general nature, applicable to each Section of these Divisions.
- .2 Articles specifying materials, equipment, installation techniques and workmanship that are applicable to more than one Section of these Divisions.
- .3 Articles that are to be read in context with and form part of relevant Sections of these Divisions.

1.5 DEFINITIONS

- .1 The words "indicated", "shown", "noted", "listed" or similar words or phrases used in this Specification, mean that material or item referred to is "indicated", "shown", "listed" or "noted" on Drawings.
- .2 The words "approved", "satisfactory", "as directed", "submit", "permitted", "inspected", or similar words or phrases used in this Specification, mean that material or item referred to is to be "approved by", "satisfactory to", "as directed by", "submitted to", "permitted by", "inspected by", Consultant.

- .3 Instructions using any form of word "provide" involves Contractor in furnishing labour, materials and services to supply and install referenced item.

1.6 LANGUAGE

- .1 Specification is written as series of instructions addressed to Contractor, and by implication to subcontractors and to suppliers. For clarity and brevity, use is made of numbered lists and bulleted lists. Where list follows semi-colon (;) punctuation is for clarity, where list follows colon (:) punctuation is to be read as short-hand form of verb "to be" or "to have" as context requires.
- .2 It is not intended to debate with Contractor reasons for these instructions, and words associated with justification for an instruction or restatement of anticipated performance have been omitted to avoid possible ambiguities.

1.7 EXAMINATION

- .1 Examine any existing buildings and services, local conditions, building site, Specifications, and Drawings and report any condition, defect or interference that would prevent execution of work.
- .2 Examine work of other Divisions before commencing this work, and report any defect or interference.
- .3 No allowance will be made for any expense incurred through failure to make these examinations of site and documents prior to Tender or on account of any conditions on site or any growth or item existing there which was visible or known to exist at time of Tender.

1.8 DESIGN SERVICES

- .1 Provide design services for elements of the Work where specified in other sections of Division 20, sealed by a professional engineer licensed in the applicable jurisdiction.

1.9 STANDARD OF MATERIAL AND EQUIPMENT

- .1 Provide materials and equipment in accordance with Section 01 61 00 - Material and Equipment.
- .2 Materials and equipment:
 - .1 new and of uniform pattern throughout work,
 - .2 of Canadian manufacture where obtainable,
 - .3 labelled or listed as by Code and/or Inspection Authorities CSA certified and CMB listed. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Safety Authority.,
 - .4 standard products of approved manufacture.
 - .5 in compliance with Standards and Regulations with respect to;
 - (a) chemical and physical properties of materials,
 - (b) design,
 - (c) performance characteristics, and
 - (d) methods of construction and installation.
 - .6 identical units of equipment to be of same manufacture.
 - .7 In any unit of equipment, identical component parts to be of same manufacture, but various component parts comprising unit need not be from one manufacturer.
- .3 Materials and equipment are described to establish standards of construction and workmanship.
 - .1 Where manufacturers or manufacturers products are identified in lists with phrase "Standard of Acceptance", these are manufacturers and/or products which meet standards with regard to performance, quality of material and workmanship.
 - .2 Manufacturers and or products used are to be chosen from these lists.

- .4 Include items of material and equipment not specifically noted on Drawings or mentioned in Specifications but which are required to make an operating system.
- .5 Confirm capacity or ratings of equipment being provided, when based on ratings of equipment being provided under other trade Sections, before such items are purchased.
- .6 Factory fabricate control panels and component assemblies.
- .7 Select materials and equipment in accordance with manufacturer's recommendations and install in accordance with manufacturer's instructions.
- .8 Materials and equipment not satisfying these selection criteria will be condemned.
 - .1 Remove condemned materials from job site and provide properly selected and approved materials.

1.10

SUBSTITUTIONS

- .1 The use of a substitute article or material which the Contractor represents to be of at least equal quality and of the required characteristics for the purpose intended may be permitted, subject to the following provisions:
 - .1 a substitution will not be considered for reasons of meeting the construction schedule unless the Contractor can demonstrate to the satisfaction of the Consultant they made all reasonable efforts to procure the specified product or material in a timely fashion,
 - .2 the Contractor must advise the Consultant of this intention to use an alternative article or material before doing so,
 - .3 the burden of proof as to the quality and suitability of alternatives to be upon the Contractor and they shall supply all information necessary as required by the Consultant at no additional costs to the Contract,
 - .4 the Consultant to be the sole judge as to the quality and suitability of alternative materials and their decision to be final,
 - .5 where use of an alternative material involves redesign or changes to other parts of the work, the costs and the time required to effect such redesign or changes will be considered in evaluating the suitability of the alternative materials,
 - .6 no test or action relating to the approval of substitute materials to be made until the request for substitution has been made in writing by the Contractor and has been accompanied by complete data as to the quality of the materials proposed. Such request to be made in ample time to permit appropriate review without delaying the work, taking into consideration that such a substitution request may be rejected and require providing the product or material as originally specified,
 - .7 Whenever classification, listing, or other certification by a recognized standards body is a part of the specifications for any material, proposals for use of substitute materials to be accompanied by reports from the equivalent body indicating compliance with the requirements of the specifications,
 - .8 The costs of all testing required to prove equality of the material proposed to be borne by the Contractor.

PART - 2 SUBMITTALS

2.1 **SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings, manufacturers and product data and samples in accordance with Section 01 33 05;
 - .1 Submit for each item of equipment such as Panelboards, Luminaire cuts and Special Systems.
 - .2 Submit shop drawings in the same unit of measure as are used on the drawings. Both metric and imperial measures may be included.

- .3 Submit shop drawings by email to: shopdrawings@hhangus.com
- .2 Include a H.H. Angus shop drawing cover sheet form prepared for this project, for each shop drawing (sample included at the end of this section), or, include the same information on the contractors submittal cover sheet:
 - .1 Information required on each submission:
 - (a) Client/Architect name
 - (b) Project Name
 - (c) H.H. Angus project number
 - (d) Date
 - (e) Contractor name
 - (f) Contractor reference No.
 - (g) Manufacturer name
 - (h) Product type
 - (i) Specification section number
 - (j) Contractor trade: mechanical, electrical, elevators, or general trades
 - (k) If a re-submission, the previous submission H.H. Angus reference number.
- .3 Submit shop drawings in PDF format;
 - .1 If submitted in hardcopy format, submit in 11 x 17, black and white originals of graphic quality suitable for photocopying. Allow one additional week for processing of shop drawings submitted in hardcopy format.
- .4 Manufacturers printed product data sheets for standard items are acceptable in place of shop drawings providing physical characteristics are identified and are related to specification references.
- .5 Submit manufacturers data sheets with typed schedules listing manufacturers and suppliers name and catalogue model number for such items as fire alarm system components, etc.
- .6 For luminaires, submit luminaire cuts with manufacturer's names and catalogue numbers for all luminaires to be used on the job. Identify and arrange the luminaire cuts and catalogue numbers in the same sequence as the Specification Luminaire list.
- .7 Shop drawings and product data to show:
 - .1 CSA or equivalent approval.
 - .2 Dimensioned outlines of equipment.
 - .3 Dimensioned details showing service connection points.
- .8 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.
- .9 Where applicable, include wiring, single line and schematic diagrams.
- .10 Include wiring drawings or diagrams showing interconnection with work of other Sections.
- .11 Each shop drawing to be checked and stamped as being correct, by trade purchasing item, before drawing is submitted. If above requirements are not complied with, shop drawings will be rejected and returned forthwith.
- .12 Before manufacture or assembly of the equipment, submit only the shop drawings showing dimensioned outlines of equipment and elevations illustrating locations of visible equipment such as breakers and their trip settings, windows, meters, and description of operation as well as single line diagrams. Submit drawings showing construction details, component assemblies or interior wiring diagrams which may be necessary for the correct functioning of the equipment.
- .13 For manufacturer's data and lighting fixtures, submit for approval, bound sets showing the fixture cuts, manufacturer's name and catalogue numbers. Each folder or binder to be

complete with all fixtures used on the job. Arrange the fixture cuts and catalogue numbers and identify in the same sequence as the specified fixture list.

2.2 **FIELD, FABRICATION, OR INSTALLATION DRAWINGS**

- .1 Contractor field, fabrication, installation, and/or sleeving drawings will not be reviewed as shop drawings. If submitted as a shop drawing, a transmittal only will be returned identifying the submitted drawings have not been reviewed.
- .2 Maintain a copy on site of such drawings for reference by the Consultant.
- .3 Provide a copy of such drawings to the Consultant for general information purpose only, upon request.

2.3 **OPERATING AND MAINTENANCE DATA**

- .1 Provide operation and maintenance data bound in 210 mm x 300 mm x 50mm thick (8½ in x 11 in x 2 in thick) size, vinyl covered, hard back, three-ring covers.
 - .1 Organize material in volumes generally grouped by Division Section; Site services, Power, Lighting, Low Voltage Systems, Fire Alarm and Security.
 - .2 Title sheet in each volume to be labeled "Operating and Maintenance Manual" and to bear Project Name, Project Number, Date, Trade Section, and List of Contents.
 - .3 Provide three hard-copies to Owner.
- .2 In addition, provide Adobe PDF files for each document, produced from original direct-to-digital file creations.
 - .1 Organize documents into separate PDF files for each Division Section identified above, and apply Adobe Bookmarks to create Table of Contents.
- .3 Include in operations and maintenance data:
 - .1 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.
 - .2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature not acceptable.
 - .3 Wiring and schematic diagrams and performance curves.
 - .4 Names and addresses of local suppliers for items included in maintenance manuals.
 - .5 Copy of reviewed shop drawings.
 - .6 The operating characteristics of the equipment supplied such as calibration curves and coordination data to allow proper co-ordination with owner's equipment.
 - .7 Description of operation of the controls and protective devices used.
 - .8 Maintenance and adjustment procedures, and lifting and jacking instructions.
 - .9 Fault locating guide.
 - .10 Spare parts list and an itemized cost.
 - .11 Name and telephone numbers of service organization and technical staff that will provide warranty service on the various items of equipment.

2.4 **OPERATING AND MAINTENANCE INSTRUCTIONS**

- .1 Supply the services of a skilled tradesman for a minimum of two consecutive full days to start each system in its proper sequence, and test and calibrate controls and set-up systems.
- .2 During this procedure thoroughly explain the operation and maintenance of each system, incorporating specialized instruction by manufacturers as described under other sections in this Division.

- .3 Arrange suitable time for instructions with Owner's operating and maintenance personnel.
- .4 Keep a record of date and duration of each instruction period together with the names of persons attending. Submit signed records at completion of instruction.

2.5 **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 every aspect of the operation, care and maintenance thereof.

2.6 **RECORD DRAWINGS**

- .1 Provide record drawings in accordance with Section 01 78 05.
- .2 A set of design drawings in AutoCad 2016 on CD or DVD ROM will be provided by the Consultant. Make sets of white prints for each phase of Work, and as Work progresses and changes occur mark white prints in coloured inks to show revisions. Dimension locations of drains, pipes, ductwork, conduit, manholes, foundations and similar buried items within the building, with respect to building column centres. Mark level with respect to an elevation which will be provided.
- .3 Survey information from excavation and backfill of site services to be held on site, after approval, and to be similarly transferred to white prints.
- .4 Retain these drawings and make available to Consultant for periodic review.
- .5 On a weekly basis, scan marked-up drawings to Adobe .pdf format. Where a project has a FTP site, post these files on a weekly basis.

2.7 **AS-BUILT DRAWINGS**

- .1 Prior to testing, balancing and adjusting, transfer site record drawing information to AutoCad 2016 (CAD) files, to record final as-built condition. Obtain a current set of CAD files from the Consultant.
 - .1 Drawings are to remain set to and follow Consultants AutoCad Standards. Do not alter drawing scales, X-refs, colours, layers or text styles.
 - .2 The Consultant's CAD files may not reflect all or any construction changes.
- .2 Where items have been deleted, moved, renumbered or otherwise changed from contract drawings, revise the CAD files to record these changes. "Bubble" these revisions, and place these annotations on a separate and easily identified drawing layer.
- .3 As-built drawings to show the final as-built condition.
- .4 Show on electrical as-built drawings final location of conduit, outlets, panels, branch wiring, system wiring, pull boxes, bus ducts, and equipment.
- .5 Show on site services as-built drawings survey information provided by Ontario Land Surveyor (OLS) monitoring services installation.
- .6 Identify each drawing in lower right hand corner in letters at least 12 mm (½") high as follows "AS-BUILT DRAWINGS. This drawing has been revised to show systems as installed" (Signature of Contractor) (Date). The site services drawings are to include (Signature and Stamp of OLS) attached to note.
- .7 The site services drawings are to include (Signature and Stamp of OLS) attached to note.

- .8 Once "AS BUILT DRAWINGS" white prints are reviewed, transfer Consultant's comments to the CAD files. Return AutoCad drawings modified to "As Built" condition to Consultants on CD or DVD Rom.
- .9 Submit three (3) sets of white prints and three (3) copies of CAD files with Operating and Maintenance Manuals.

PART - 3 REFERENCE CODES STANDARDS AND REGULATIONS

3.1 CODES AND STANDARDS

- .1 Do complete installation in accordance with Ontario Electrical Safety Code (OESC) except where specified otherwise.
- .2 Do underground systems in accordance with CSA C22.3 No.7-M86 except where specified otherwise.
- .3 Abbreviations for electrical terms: to CSA Z85-1983.
- .4 Comply with CSA Certification Standards and Ontario Electrical Safety Code Bulletins in force at time of Tender submission.
- .5 Where requirements of this specification exceed those of the above mentioned standards, this specification to govern.

3.2 CONFINED SPACES

- .1 Unless otherwise proscribed by the Constructor's / Owner's workplace safety program, treat spaces not designed and constructed for continuous human occupancy as "confined spaces", including but not limited to:
 - .1 horizontal and vertical service spaces, shafts, and tunnels,
 - .2 inside of equipment which permits entry of the head and/or whole body, and
 - .3 ceiling spaces which are identified as containing a hazardous substance.

3.3 PERMITS, FEES AND INSPECTIONS

- .1 Submit to Electrical Safety Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Consultant will provide 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 from Electrical Safety Authority and authorities having jurisdiction on completion of work to Consultant.

PART - 4 FIELD QUALITY CONTROL

4.1 TESTING

- .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, heaters and associated control equipment including sequenced operation of systems where applicable.
- .5 Systems: fire alarm system, communications.
- .2 Arrange and pay for services of applicable manufacturer's factory service engineer or certified independent testing organization to supervise initial start-up of specialized portions of installation and to check, adjust, balance and calibrate components including related wiring and controls. Provide these services for such periods, and for as many visits as may be necessary to put applicable portion of installation in complete working order. Provide a certificate indicating that the equipment is free and clear of deficiencies.
- .3 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .4 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.
- .5 Carry out tests in presence of Consultant.
- .6 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .7 Submit test results for Consultant's review. Test electrical equipment to standards and function of specification and applicable codes in an approved manner. Replace defective equipment and wiring with new material and leave entire system in complete first class operating condition.

4.2 **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 current 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.

4.3 **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 per equipment manufacturers recommendations for each piece of equipment.

4.4 **CLEANING**

- .1 Do final cleaning [in accordance with Section 01 74 23.
- .2 At time of final cleaning, clean lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dust and dirt, including the top surface, whether exposed or in the ceiling space.
- .3 Clean switch, receptacle, and communications outlets, coverplates, and exposed surfaces.
- .4 Clean all other electrical equipment and devices installed as part of this project.
- .5 Electrical, UPS Equipment or Communication Closets:
 - .1 Thoroughly vacuum and clean interiors and all panels, cabinets and other electrical equipment of all construction debris and dust prior to energization using a HEPA

vacuum cleaner. Final clean using clean lint free cloths with a cleaning liquid as recommended by the manufacturer for the purpose.

- .2 HEPA vacuum the top of all panels, cabinets, cable trays and conduits, followed by a thorough HEPA vacuuming of the floors. Thoroughly wash floors with wet mop and clean water. Control access to the room after cleaning. Provide temporary filter media on air supply ducts to these rooms to prevent re-contamination from other areas of construction.
- .3 Thoroughly re-clean as necessary prior to final turn over.

4.5 **FINAL INSPECTION**

- .1 At project completion submit written request for a final inspection of electrical systems. Include with this submission written certification that:
 - .1 Deficiencies noted during job inspections have been completed.
 - .2 Systems have been balanced and tested and are ready for operation.
 - .3 Completed maintenance and operating data have been submitted and approved.
 - .4 Tags are in place and equipment identification is completed.
 - .5 The cleaning up is finished in every respect.
 - .6 All electrical panels, switchboards, cabinets, and equipment surfaces have been touched up with matching paint, or re-finished as required
 - .7 Spare parts and replacement parts specified have been provided and receipt acknowledged.
 - .8 As-built and Record drawings are completed and approved.
 - .9 Owner's operating personnel have been instructed in operation and maintenance of systems.
 - .10 Fire alarm verification is 100% completed and Verification Certificate has been submitted and accepted.

PART - 5 EQUIPMENT

5.1 **WARNING SIGNS**

- .1 As specified and to meet requirements of Electrical Safety Authority and Consultant.
- .2 Porcelain enamel decal signs, minimum size 175 mm x 250 mm (7" x 10").

5.2 **PROTECTION**

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark live parts "LIVE 120 VOLTS", or with appropriate voltage.
- .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

5.3 **SLEEVES AND CURBS**

- .1 Provide sleeves of galvanized steel for conduit and cable runs passing through concrete walls, beams, slabs and floor. Sleeves for bus ducts, wireways and cable trays to be minimum 3 mm (1/8") galvanized steel.
- .2 Provide concrete curbs, minimum 100 mm (4") high above finished floor surrounding openings where bus ducts, wireways and cable trays rise through slabs above grade to prevent debris and water from falling to floor below. Concrete curb to have sufficient area to adequately carry bus duct support brackets.
- .3 Provide concrete curbs, minimum 100 mm (4") high above finished floor for telephone cable risers and other openings intended for electrical use in slabs above grade.

- .4 Extend galvanized sleeves for conduit rising through slabs 100 mm (4") minimum above finished floors. Provide sleeves, passing through floors having a waterproof membrane, with an integral flashing clamp.
- .5 Where cables or conduits pass through floors and fire rated walls, pack space between wiring and sleeve full with Fireproofing, and seal with caulking compound conforming to CANZ-19.13.

5.4 **FIREPROOFING**

- .1 The integrity of the fire resistance rating of the floors and walls to be maintained around electrical raceways and/or cables passing through such floors and/or walls.
- .2 Materials used to maintain fire resistance ratings to have a minimum 2 hour ULC or cUL listed rating.
- .3 Wiring may penetrate a fire resistance rated assembly provided it is enclosed in non-combustible conduit, and the passage of the conduit in turn is suitably sealed to the assembly with fire stop material.
- .4 Wiring with a combustible covering and not enclosed in non-combustible conduit penetrating a fire resistance rated assembly shall be grouped into separate fire sealed penetrations to ensure the overall diameter of the combined wire(s) in each penetration does not exceed 25 mm, and that the integrity of the fire rated assembly is not compromised.
- .5 Single conductor metal sheathed cables shall be arranged to individually penetrate the fire rated assembly and be individually fire stopped.
- .6 Where wiring is installed in cable trays and must penetrate a fire rated assembly, stop and independently support the cable tray immediately on each side of the fire rated assembly while allowing sufficient working room to properly install and inspect the fire rating materials and penetration.

Standard of Acceptance

- Thomas & Betts - Flame-safe
- Nelson/Wieland (Electrovert) - Flameseal
- Double A/D Distributors Ltd. - Firebarrier Firestopping
- Canstrut - Elasta-Seal MBF-KBF sealbags (where open tray passes through floor slab)

5.5 **SPRINKLER PROTECTION**

- .1 Equipment in sprinklered areas, except for weatherproof equipment, must be provided with hoods or shields and gasketed doors for protection against sprinkler discharge, and to comply with the requirements of OESC.
- .2 Ventilation openings to be overhanging drip proof type
- .3 Weatherproof equipment, where noted in the specifications and/or drawings to have EEMAC type 3 enclosures in accordance with the requirements of CSA C22.2 No. 94 Standard.
- .4 Surface panelboards, switchboards and other electrical equipment in sprinklered areas to be fitted with watertight hubs with insulated throat for all conduit entrances.

Standard of Acceptance

- Thomas & Betts Ltd. - Series 401
- Efcor of Canada Ltd. - Series 40-50B

5.6 **ACCESS DOORS**

- .1 **In all cases where electrical elements, requiring access, are concealed above ceilings or in walls this Division is responsible to review, in the presence of the Owner, the Architect, the Consultants and the General Contractor, the exact details, locations and types of proposed access.**
- .2 Submit list of proposed access door locations and obtain approval thereof before commencing access door installation.
- .3 Submit access door shop drawings for approval as soon as possible after Award of Contract, showing size, type and exact location of access doors.
- .4 Access doors, unless otherwise specified or shown, to be at least 3 mm (12 gauge) steel, finished prime coat only, with concealed hinges, anchor straps, plaster lock, without screws.
- .5 Access doors in ceilings, where acoustic tile is applied to plaster or gypsum board, to be dish type designed to receive the tile insert.
- .6 Inside frame dimensions to be approximately 300 mm x 450 mm (12" x 18"). However, if it is necessary for personnel to enter through doors, they to be at least 600 mm x 450 mm (24" x 18").
- .7 Access doors to be as manufactured by:
 - Standard of Acceptance*
 - o Zurn Industries Canada Ltd. - Inspectors
 - o LeHage Industries Ltd.
 - o A. G. Baird Limited - ABCO
 - o Stelpro Limited - Type 700
- .8 Provide access doors for locations where equipment requiring maintenance or adjustment is "built-in".
- .9 These access doors will be installed under the Division in whose work they occur. Arrange for and pay cost of access door installation.
- .10 Access doors are not required in removable acoustic panel type ceilings.
- .11 Provide approved coloured marking devices after completion of such ceilings, at four corners of each panel below point requiring access.
- .12 Size and locate access doors in applied tile, or in glazed or unglazed structural tile to suit tile patterns. Refer to Architectural Room Finish Schedule and details on Architectural Drawings in this regard.

PART - 6 COORDINATION

6.1 GENERAL

- .1 Consultant drawings are diagrammatic and illustrate the general location of equipment, and intended routing of ductwork, piping, etc, and do not show every structural detail. In congested areas drawings at greater scale may be provided to improve interpretation of the Work. Where equipment or systems are shown as "double line", they are done so either to improve understanding of the Work, or simply as a result of the use of a CAD drawing tool, and in either case such drawings are not represented as fabrication or installation drawings.
- .2 Lay out and coordinate Work to avoid conflict with work under other Divisions. **Note: the Mechanical Contractor is responsible for preparing very detailed three-dimensional Co-ordination/ Interference Drawings (refer to Spec Section 20-01-03) and this Division must co-ordinate/ assist with the preparation of these Drawings ensuring Drawings show, in the three-dimension, all Lights, Power Elements, System Components AND CONDUITS (specifically important in the EP Suite areas)**

- .3 Make good damage to Owner's property or to other trade's work caused by inaccurate layout or careless performance of work of this Division.
- .4 When equipment provided under other Sections connects with material or equipment supplied under this Section, confirm capacity and ratings of equipment being provided.
- .5 Take information involving accurate measurements from dimensioned Architectural Drawings or at building.
- .6 Install services and equipment which are to be concealed, close to building structure so that furring is kept to minimum dimensions.
- .7 Location of conduit, bus duct, raceways and equipment may be altered without extra cost provided instruction is given or approval is obtained, in advance of installation of items involved. Changes will be authorized by site instructions and are to be shown on Record Drawings.
- .8 Include incidental material and equipment not specifically noted on Drawings or mentioned in Specifications but which is needed to complete the work as an operating installation.

6.2 **FIELD, FABRICATION, AND INSTALLATION DRAWINGS**

- .1 Prepare field, fabrication, and/or installation drawings to show location of equipment and relative position of services, and to demonstrate coordination with works of other trades.
 - .1 Drawing scale: minimum 1:50 (1/4"=1'-0")
- .2 Use information from manufacturer's shop drawings for each trade and figured dimensions from latest Architectural and Structural Drawings.
- .3 Layout equipment and services to provide access for repair and maintenance.
- .4 Submit drawings to other trades involved in each area and include note in drawing title block as follows;
 - .1 "This drawing was prepared and circulated for review and mark-up to related subcontractors as noted and initialed in the table below. Corrections and concerns identified through this coordination process have been addressed on this drawing. Areas that incorporate significant changes from layouts shown on Contract Drawings have been circled for Consultants' review"

6.3 **CUTTING AND REMEDIAL WORK**

- .1 Cutting and patching of existing work in the areas being renovated under the scope of this project and to accommodate the Work, unless otherwise noted, will be done by the General Trades Contractor. Layout such work for approval before undertaking same.
- .2 **However, there are areas where work is delineated for this Division but that does not require work by the General Contractor (specifically, routing of new electrical services through existing un-renovated spaces). In these areas, cutting and patching of existing of general trades work and temporary removal/reinstallation of ceilings to accommodate work of this Division must be arranged and paid for under this Division.**
- .3 Assume responsibility for prompt installation of work in advance of concrete pouring or similar work. Should any cutting or repairing of either unfinished or finished work be required because such installation was not done, employ the particular trade, whose work is involved, to do such cutting and patching. Pay for any resulting costs. Layout such work for approval before undertaking same.
- .4 Holes required in existing construction to accommodate cable, raceways, bus duct or cabletray to be cut neatly or drilled.

- .5 Division 26 contractor to be responsible for arranging and paying for all cutting and patching as required. Before cutting, drilling, or sleeving structural load bearing elements, obtain the Consultant's approval of location and methods in writing. Employ original installer or expert in the finishing of material required to perform cutting or patching for weather exposed or moisture resistant elements or sight exposed surfaces.
- .6 All core drilling through floor slabs to be X-rayed and verified with Owner's representative prior to coring. Relocate core drilling location if steel or conduit is found in the proposed location and repeat procedure. Reroute any circuits damaged by core drilling.

6.4 **WORK IN EXISTING BUILDING**

- .1 Refer to Division 01 - General Requirements.
- .2 During the tender period, the Contractor shall perform a site inspection of the place of work and surroundings including the accessible ceiling spaces and other areas where access could be considered reasonable. Make a thorough investigation of As Built conditions to determine scope of renovation or demolition work required prior to submitting tender.
- .3 Work includes changes to existing building and changes at junction of old and new construction. Route cabling, ducts, conduits and other services to avoid interference with existing installation.
- .4 Relocate existing pipes, ducts, conduits, bus ducts and any other equipment or services required for the proper installation of new work.
- .5 Maintain or relocate existing services which pass through the area of renovation or demolition, but which feed items located outside of these areas. Rewire devices to the original circuits.
- .6 Remove existing lighting fixtures, wiring, devices and equipment to suit new construction. Cut back and cap conduits and electrical outlets, not being used, so that finished work presents a neat and clean appearance. Disconnect at point of electrical supply, remove obsolete wiring and conduits, and make existing systems safe. Blank off openings in panels or boxes from removed conduits or ducts.
- .7 Unless noted to be reused, removed conduit, wiring and devices become the property of the Contractor and are to be taken from the site and disposed of appropriately.
- .8 Removed lighting fixtures and equipment shall be reviewed at site with the Owner's representative, and if the Owner instructs they wish to keep any items, they shall be moved to a designated location on the site. Lighting fixtures and equipment that the Owner does not want shall be taken from the site and disposed of appropriately.
- .9 Provide junctions boxes, outlet boxes, wiring, plates, etc..., as necessary for complete relocation of devices, fixtures and equipment.
- .10 Revise panelboard directories accordingly if affected by work.
- .11 Clean and re-lamp relocated lighting fixtures and replace any faulty ballasts.
- .12 On completion of relocations, confirm relocated devices and lighting fixtures are in proper working order.
- .13 Co-ordinate work affecting fire alarm system, fire safety, and detection systems with Consultant, Fire Alarm System Manufacturer, and authorities having jurisdiction prior to commencing work. Retain original fire alarm system manufacturer to verify all relocated fire

alarm devices and all revised wiring. Provide temporary fire protection and/or a fire watch as required by authorities having jurisdiction in all areas affected by the demolition.

- .14 Where Owner wishes to take over renovated areas ahead of project completion date and these areas are intended to be fed from distribution systems in new building, make temporary connections to existing services in these areas. Reconnect to permanent services, at a later date, when new distribution systems are available.

6.5 **CONTINUITY OF SERVICES**

- .1 Refer to Division 01 - General Requirements.
- .2 Connections to existing systems to be made at approved times. Obtain written approval recording times when connections can be made. Arrange work so that physical access to existing buildings is not unduly interrupted.
- .3 Be responsible for any damages caused to existing systems when making connections.
- .4 Keep existing buildings in operation with minimum length of shutdown periods. Include overtime work to tie-in piping or wiring at night or on weekends. Provide temporary feeders and connections as required to maintain systems in operation where shutdown periods will exceed 8 hours, or extend beyond the allowable time frame determined by the Owner.

6.6 **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.

6.7 **FINISHES**

- .1 Primary and final painting for Work, other than items specified as factory primed or finished, to be done under Finish Division 9.
- .2 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .3 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .4 Leave a quart can or a pressurized spray can of paint, as used with switchboards, with owner for touch-up purposes.
- .5 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
- .6 Store electrical materials and equipment such as switchboards, panels, transformers and luminaires in a dry, clean location and cover with polyethylene plastic to preserve factory finish.
- .7 Protect exposed or free standing equipment with plastic to minimize entry of dust and dirt and marring of finished surfaces during progress of work
- .8 Schedule luminaires, lamps and diffusers for installation as late as possible during construction in order to minimize accumulation of dust and/or dirt on them. Clean luminaires and diffusers, not acceptable because of dust and dirt, in an approved manner as specified by manufacturer. Wrap surface mounted and suspended luminaires, installed prior to painting and other dusty construction being completed in the area, in plastic to prevent dirt and paint from settling on them.

6.8 **EQUIPMENT IDENTIFICATION**

- .1 Identify electrical equipment with nameplates and labels as follows:
- .2 Nameplates:
 - .1 Nameplates for panels and equipment to be 3 mm (c") thick, black lettering on white background, with bevelled edges and mechanically attached with self-tapping stainless steel screws.

NAMEPLATE SIZES			
Size #	Size	Lines	Letter height
1	10 x 50 mm (½" x 2")	1 line	3 mm (c") high
2	12 x 70 mm (½" x 3")	1 line	5 mm (¼") high
3	12 x 70 mm (½" x 3")	2 lines	3 mm (c") high
4	20 x 90 mm (1" x 4")	1 line	8 mm (d") high
5	20 x 90 mm (1" x 4")	2 lines	5 mm (¼") high
6	25 x 100 mm (1" x 4")	1 line	12 mm (½") high
7	25 x 100 mm (1" x 4")	2 lines	6 mm (¼") high

- .3 Labels: Embossed plastic labels with 6 mm (¼") high letters unless specified otherwise.
- .4 Wording on nameplates and labels to be approved by [Consultant][Engineer] prior to manufacture.
- .5 Allow for average of thirty-five (35) letters per nameplate and label.
- .6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.
- .10 Identify other cabinets for low voltage systems, such as signals and communications, as for panelboards with a directory showing circuit numbers and room locations plus a blank for "Remarks", as well as a lamicoïd plate designating panel name.
- .11 Typical Identification Standards
 - .1 Lighting, Receptacle an Power panels to each be identified with an engraved lamicoïd plate secured to top interior trim as:
 - (a) LP-1A 12 mm (½") high lettering
 - (b) 120/208 volts 5 mm (¼") high lettering
 - (c) Fed from PP 'AA' 5 mm (¼") high lettering

- .2 Supply each panel with a directory card holder welded to inside of door, complete with a neatly typewritten list showing information as follows:

Panelboard Name		LP-1A
Panel Voltage		120/208 Volts
Circuit Number	Description	
1	Lighting Room #34	
2	Receptacles Room #34	
3	Ice Machine Room #17	

- .3 Cover list with a 0.8mm (1/32") minimum thick clear plastic sheet to protect it.
- .4 Identify equipment not listed above, such as incoming service cables, communicating cables, switchgear, transformers, disconnects, contactor motors, instruments, fire alarm, clock and program equipment and control panels, in a similar manner showing name and number of the equipment, voltage and load information.
- .5 Labels for Emergency Lights shall consist of a glue on red dot in one corner of the light lens clearly visible from the floor.
- .12 Identify feeder pull boxes and junction boxes with lettering stamped on brass or aluminum tags showing feeder or system concerned, voltage involved and data for both termination points whether equipment or panel. Tag to be held to boxes under lid screws using steel wire.
- .13 Apply a small dab of paint to inside of each outlet box, pull box and panel as it is installed, using colour code as follows:

Red	Fire Alarm System and Emergency Voice Communication System
Dark Blue	Intercom and Public Address
Dark Green	Telephone and Data Systems
Black	Annunciator and Buzzer System
Grey	Clock System
White	Central Dictation
Orange	Nurse Call
Yellow	Alarm Systems
Pink	Computer Systems
Light Green	TV Systems
Light Blue	Miscellaneous

- .14 Colour code is not required for regular lighting and power circuits.

- .15 Junction boxes in furred ceilings to have colour identification on both inside and outside.
- .16 Provide identification of emergency lights consisting of a glue-on red dot in one corner of the light unit.
- .17 For lighting luminaires specified with both a normal and emergency power connection provide identification on luminaires internal barrier designating dual power feeds.
- .18 Cubicles and/or cells to include main identifier nameplate on rear of cells

Standard of Acceptance

- o W. M. Brady Co. of Canada Limited - B350
- o IDI Electric (Canada) Ltd. - Style A

6.9 **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 C22.1-1990.
- .4 Use colour coded wires in communication cables, matched throughout system. Schedule and chart marker number or colour with corresponding equipment and include with record drawings or operation and maintenance data.
- .5 Connections in equipment to be Phase A, B, C from left to right when viewing from front or accessible direction.
- .6 Carry colour coding through from incoming utility supply down to and including panels as follows:
 - .1 Identify incoming utility service lines by Red - Phase "A", Black - Phase "B", Blue - Phase "C", with enamel paint.
 - .2 Band switchgear buswork in each switchboard and unit substation cubicle with tape identified in accordance with service lines colour-coding. In addition, where neutral bus is introduced, it to be banded white. Ground bus to be banded green.
 - .3 Band feeder and sub-feeder bus or conductors as above.
 - .4 Band main bus on lighting and power panels with tape as follows, to conform to the Electrical Safety Code.

Red	Phase A
Black	Phase B
Blue	Phase C
White	Neutral
Green	Ground
Orange	Control

- .7 Identify control conductors for motors and equipment by pressure sensitive tape markers or permanent PVC sleeve markers at each main terminal point and wherever they are introduced into ducts or equipment. Schedule and chart marker numbers with corresponding machine numbers and locations and include with Record Drawings.

6.10 CONDUIT AND CABLE IDENTIFICATION

- .1 Label feeder conduits.
- .2 Locate labels as follows:
 - .1 At every end of every conduit, duct or cable run, adjacent to item of equipment serviced.
 - .2 On each exposed conduit, duct or cable passing through a wall, partition or floor (one on each side of such wall partition or floor).
 - .3 At intervals of 15 m (50') along every exposed conduit, duct or cable run exceeding 15 m (50') in length.
 - .4 At every access point on concealed conduit duct or cable.
- .3 Labels to be visible from 1.5 m (5') above adjacent floor or platform.

6.11 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.
- .2 Manufacturers and CSA labels to be visible and legible after equipment is installed.

6.12 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Division 01 - General Requirements.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm (6") horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm (10'), and information is given before installation.
- .4 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

6.13 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.

Description	General Area	Barrier Free
Local switches	1200 mm (47")	1200 mm (47")
Wall receptacles: General	600 mm (24")	600 mm (24")
Wall receptacles: above top of continuous baseboard heater	200 mm (8")	200 mm (8")
Wall receptacles: above top of counters or counter splash backs	175 mm (7")	175 mm (7")
Wall receptacles: In Mechanical rooms	1200 mm (47")	1200 mm (47")

Description	General Area	Barrier Free
Panelboards	As required by code or as indicated	
Telephone outlets	600 mm (24")	600 mm (24")
Wall mounted telephone outlets	1500 mm (60")	1200 mm (47")
Fire alarm pull stations	1500 mm (60")	1200 mm (47")
Fire alarm bells	2100 mm (83")	
Television outlets	300 mm (12")	450 mm (18")
Wall mounted speakers	2100 mm (83")	
Clocks	2100 mm (83")	

6.14 CONDUIT AND CABLE INSTALLATION

- .1 Sleeves through concrete: galvanized steel, minimum 3 mm (1/8") sized for free passage of conduit, and protruding 50 mm (2").
- .2 Arrange for holes through exterior walls and roof to be flashed and made weatherproof under Division 7.
- .3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.
- .4 Supply and deliver inserts to site in ample time to be built into work of other trades. Provide necessary templates and adequate instructions and assistance to locate and install inserts.
- .5 Secure inserts firmly to form work before concrete is poured.
- .6 Provide sleeve and insert drawings as required.

6.15 PLYWOOD BACKBOARDS

- .1 Provide plywood backboards in electrical and telecommunications rooms and closets where indicated on drawings and where referenced under various sections of the specifications for mounting of equipment.
- .2 Plywood to be securely fixed to the building structure.
- .3 Plywood to be 19mm, void free, good one side, mounted with good side exposed
- .4 Plywood to be Class A fire retardant, FSC certified, contain no added urea formaldehyde, and be suitable for compliance with LEED credits MR 5.1 + 5.2 (Manufactured and Extracted Regionally), MR 7.0 (Certified Wood), and EQ 4.4. (Low Emitting Materials). Provide necessary documentation to support LEED credit application process.
- .5 Plywood to be treated as follows on all surfaces:
 - .1 Initially seal the plywood with one coat of Sherwin Williams part No. B49 W 2 wood primer
 - .2 Follow with one coat of Flame Control 10-10 Intumescent Fire Retardant Paint
 - .3 Finish with one coat of Flame Control 40-40 Fire Resistant Paint

6.16 **WIRING OF MECHANICAL TRADES MOTORS**

- .1 To limit responsibility and to specifically define the Work under this Division, use the following procedure with regard to motors provided under Mechanical Division 20..
- .2 The Contractor under Mechanical Division 20 will be responsible for installing equipment which he supplies including motors, starters, disconnect switch, Motor Control Centres and miscellaneous controls of the type specified. **For Refrigeration Equipment compressor and D/X Air Conditioning Equipment, Division 26 is to provide a weather-proof disconnect at the equipment, mounted independent of the A/C Equipment and complete final connection to the equipment using a minimum of 610mm (24") length of seal-tight flex conduit**
- .3 In every instance whether pertaining to Plumbing, Air Conditioning, Refrigeration, Heating or Ventilating equipment, wire to line side of the Motor Control Centre, disconnect switch, or starter provided by these trades, in reasonable proximity to equipment being controlled.
- .4 From this point, unless otherwise noted, the cost of electrical material and labour will be borne by the particular trade whose work is involved. That trade will mount starter and wire from it to motor being controlled, together with control wiring, remote switches, and pilot lights.
- .5 Where individual starters and controls are grouped together, the Contractor under Mechanical Division 20 will provide a panel for mounting his equipment. Provide a feeder, main fused disconnect, a splitter of adequate size and capacity, [individual fused disconnect switches,] and wire to line side of the Division 20 starters.
- .6 For Refrigeration Equipment compressor and D/X Air Conditioning Equipment, Division 26 is to provide a weather-proof disconnect at the equipment, mounted independent of the A/C Equipment and complete final connection to the equipment using a minimum of 610mm (24") length of seal-tight flex conduit.
- .7 In the case of unit heaters, reheat coils, electrical control devices, and cabinet unit heaters, terminate wiring in an outlet immediately adjacent to motor or device being electrically powered. Wiring from this point to starter, thermostat, or other devices will be done under Mechanical Division 20.
- .8 Provide branch circuit wiring and an outlet for each motorized damper or heating control.
- .9 Ascertain exact locations of starters, Motor Control Centres and motors, from Mechanical Drawings.
- .10 Motors up to and including 0.25 kW (¼ HP) to be 120 volt, 60 Hz, single phase.
- .11 Motors.37 kW (½ HP) and above to be 3 phase, 60 Hz, voltage as noted

6.17 **TEMPORARY AND TRIAL USAGE**

- .1 Temporary and trial usage by Owner of equipment or any other work or materials supplied before final completion and written acceptance is not to be construed as evidence of acceptance by Consultant.
- .2 Consultant to have the privilege of such temporary and trial usage, as soon as supplier claims that said work is completed and in accordance with specifications, for such reasonable length of time as is deemed to be sufficient for making a complete and thorough test of same.
- .3 Claims for damage not to be made by supplier for the damage to or breaking of any parts of such work which may be used, whether caused by weakness or inaccuracy of structural parts or by defective materials or workmanship of any kind whatsoever.

6.18 **COMMISSIONING**

- .1 Equipment supplied on this project will be subject to detailed factory inspection and on-site testing and commissioning prior to being placed in service. The electrical contractor, their major system and equipment suppliers, and the Independent Testing Agent (ITA) will be required to participate in special commissioning meetings to review progress and status of the commissioning program.
- .2 Include in Bid amount for licenced electricians to participate in the commissioning program, to undertake temporary power connections, operation of equipment, opening and closing of panel boards and switchboards, testing of power and control wiring, and assisting the ITA and the equipment suppliers' field personnel in the start up and testing of the equipment.
- .3 The contractor and equipment suppliers to include in the Bid amount for all costs to accommodate and undertake factory and site testing.

6.19 **TRAINING**

- .1 Include in the major equipment supply tender prices the services of a qualified technical representative to conduct "hands-on" training programs for the Owner's staff.
- .2 The training to include an overview of equipment function and operation, basic inspection, housekeeping and logging procedures.
- .3 Submit an outline of the training program for review, adjustment and approval by the Consultant. Training will occur in up to 3 separate sessions, at a time convenient to the Owner, to suit multiple shift maintenance staff schedules.
- .4 Sessions may be videotaped by the Owner as an aid to ongoing training of Owners staff.

6.20 **PROTECTION DURING CONSTRUCTION**

- .1 Provide protection required to enable existing building and equipment to remain in continuous and normal operation, and maintain construction schedule.
- .2 Take the necessary precautions to protect equipment, existing building and service from damage during rearrangement. Accept responsibility for any damage which may occur and make good without cost to the Owner. Accept responsibility for damage to existing services and make good without cost to the Owner.
- .3 It is of vital importance, during work of this Contract, that all existing surfaces and items, including walls, floors, ceilings, windows, doors and frames, piping, ductwork and light fixtures, are not damaged in any way whatsoever by the work of all trades. Take all precautions required or necessary to prevent any such damage, supplying all protection, hoarding, tarpaulins and dust sleeves. Any damage caused because of lack of such protection or lack of preventative measures to be made good at no cost to the Owner. Ensure that the work in the existing building, such as floors, finishes and trim, is protected as completely as possible to hold the replacing of damaged work by each sub-contractor to a minimum.
- .4 Care to be taken when working above or around UPS modules, batteries and switchgear as this equipment must remain in service. Care to be taken to eliminate dust in these equipment areas.
- .5 Switchgear fronts must be protected from accidental breaker trips when working around or above them. Provide a extended shield with 12 mm (½") plywood coated with fire retardant paint a minimum of 450 mm (18") from board front to allow access to board.

6.21 **HOUSEKEEPING**

- .1 Scrap and refuse to be removed from the work area daily. Whenever possible, clean up immediately following completion of work. A high level of cleanliness must be maintained. Sweep and damp mop daily.
- .2 Oily and waste solvent rags are a fire hazard and to be deposited in approved containers.
- .3 Conduit, wires or cables, tools or equipment are not be left in such a way that they constitute a hazard.
- .4 Openings in the roof or floor to be guarded to prevent to prevent stock or scrap from dropping down.
- .5 Loose equipment and tools shall be cleaned off overhead areas before leaving each day.
- .6 Boards with protruding nails shall not be left on the floor.
- .7 Bolts shall be cut off at floor level to eliminate a possible tripping hazard.

6.22 **OWNER'S SPECIAL REQUIREMENTS**

- .1 Contractor must provide a written list of names for employees and sub-trades entering the building, advising which areas they need access to at least 48 hours prior to expected time of arrival. This lead time is required to prearrange security passes.
- .2 Security Passes must be visibly worn at all times by all employees.
- .3 All trades people must strictly adhere to Building Security regulations or entrance into the building will be denied.
- .4 All trades people are to enter the entrance identified by the Owner. Vehicles are to be parked in proper designated areas. Driveways are not to be blocked.
- .5 Freight elevator must be used at all times to transport tools and material. Freight elevator door must be shut immediately after exiting the cab.
- .6 Under no circumstances are any electrical or mechanical systems to be disabled or activated without prior knowledge and approval by the Owner's Project Manager. Prior to disabling or activation of any electrical or mechanical systems, Building Operations and Building Security must also provide approval.
- .7 Prior notification must be forwarded to Building Security Staff before any construction activity can start which will result in heat, smoke, dust or fumes, such as sawcutting, soldering, spray painting, which can affect the sensitive fire protection equipment.
- .8 Contractor responsible for scheduling and meeting the sub-trades daily on site, showing all trades people the work areas and work to be done.
- .9 Trades-people are to supply and use their own tools. No tools, ladders or equipment, etc. will be loaned.
- .10 Contractor is responsible for all associated environmental cleaning to the job site, daily during construction and upon completion. This includes both under raised floor and above ceiling. No materials or garbage will be permitted to be stored on the loading dock.
- .11 Special care and attention must be adhered to at all times when transporting equipment and materials to prevent accidental damage to the fire protection equipment and all furnishings and fixtures.
- .12 "No Smoking" - smoke free building. Violators will be denied entry. Smoking is not allowed on the roof.

- .13 If Building Operations deems that work on a particular system requires security escort, the Contractor should allow 48 hours to make appropriate arrangements.
 - .14 For any fire system isolation requests, the Contractor should allow for 24 hours notification to Building Operations.
 - .15 For any open flame work, a fire extinguisher and security fire watch is required, and will be provided and paid for by Owner. Provide 24 hour notice prior to work to allow Owner to make necessary arrangements.
 - .16 Storage of materials on site must be cleared through the Building Manager.
 - .17 Contractors must perform a daily cleanup prior to leaving the site.
 - .18 Oxygen and acetylene cylinders are to be secured at all times and capped nightly.
 - .19 Work performed on operating and redundant systems must be restored to their normal condition at the end of each work day.
 - .20 At the conclusion of each work day, the Contractor's supervisor is to advise the Building Manager on the day's activities and plans for the next day's work. A security escort will be required for any work being done in secured areas, e.g. raised floor, computer room and mechanical/electrical rooms.
- 6.23 **CONTRACTORS SITE OFFICE & LUNCHROOM**
- .1 Contractor to provide site office and lunchroom facility.
 - .2 Contractor to provide and pay for temporary telephone/fax/ internet (email) service. Contractor will be responsible for all charges.
 - .3 Owner's cafeteria is off limits.
- 6.24 **CORE DRILLING**
- .1 Wherever core drilling is required, provide temporary dust proof screens as specified.
 - .2 In areas where core drilling through existing slab is necessary, the areas to be drilled to be marked out clearly on the underside of slab. Owner's representative to be notified at least 1 week prior to core drilling operation. Tarping of equipment will be responsibility of Contractor supervised by the Owner.
 - .3 During all core drilling operations, ensure that a minimum of one person is stationed directly below the area of drilling with a large plastic container pressed to underside of slab to hold core and water upon completion of operations.
 - .4 A wet/dry commercial quality vacuum to be used continuously at location of drilling operation to remove all excess water from area.
 - .5 Prior to core drilling, approval shall be obtained in writing from the [Consultant][Engineer]. Hole locations are to be x-rayed prior to drilling. Costs for x-rays are to be carried by the Contractor. X-raying will typically be required to occur during premium time
- 6.25 **TEMPORARY DUST PROOF SCREENS**
- .1 Provide temporary dust proof screens where required to separate areas of new work from existing areas and to prevent dust to settle on the Owner's plant and equipment. Dust proof material to be neoprene coated nylon tarpaulin or other types of fabric as approved by the [Consultant][Engineer].
 - .2 Extend dust proof screens from floor to underside of floor or roof above. Lap all sections of screen sheets 150 mm (6") minimum. Tape all lapped sheets.

- .3 Provide all temporary framing required. Secure all screen sheets at top, bottom and ends. Tape perimeter of screen to ensure dust proof environment.
- .4 Co-operate with Owners in the erection of temporary dust proof screens. Remove screens when and as directed by Consultant.

6.26 **PROTECTION OF FLOORS DURING EQUIPMENT INSTALLATION**

- .1 Provide protection of existing floor finishes during installation or removal of equipment, and at any other time when moving or installing heavy equipment.
- .2 Protect floors in rooms noted
- .3 Install 19mm ($\frac{3}{4}$ ") plywood over 5 mil plastic over finished floor areas when moving heavy equipment that could damage floor finish.
- .4 Repaint or re-tile any floors or walls damaged or scratched during construction.

6.27 **CONSTRUCTION POWER AND TEMPORARY ELECTRICAL SERVICES**

- .1 Provide temporary electrical power services during construction for temporary lighting and operating of power tools and other equipment. Provide necessary Revenue Canada approved kWhr metering unit.
- .2 Arrange for connection with the Owner into existing switchboards as indicated. Pay all costs for installation, maintenance and removal.
- .3 Provide and maintain temporary lighting throughout project. Level of illumination on all floors and stairs to not be less than 162 Lux.
- .4 Temporary electrical power service are available at site in locations designated by Owner.
- .5 Contractor and sub-contractors to provide transformers and suitable fused disconnect switches and wiring from locations as and where required and to maintain temporary services for use of light, tools, and apparatus, in order to facilitate completion of work, in accordance with applicable local by-laws.
- .6 Notwithstanding the above, where a Contractor proposes to use electric welding, a portable motor generator set to be provided by Contractor to avoid undue disturbances on the building's electrical distribution system, located to the satisfaction of Owner.
- .7 Electrical demand and consumption charges are to be metered
 - .1 Costs for this shall be paid by the General Contractor and all costs for the duration of the project shall be included in the Bid Amount.
- .8 If, during installation phase of project, it becomes necessary to have a temporary interruption in the Owner's utilities, Owner will inform Contractor as soon as possible before any such interruption. Contractor and sub-contractors to then take such action as is necessary to accommodate said interruption in their installation schedule.

6.28 **PRICING OF CHANGE NOTICES**

- .1 The value of a proposed change in the work shall be determined in one or more of the following methods:
 - .1 by time and material;
 - .2 by unit prices set out in the Contract or subsequently agreed upon;
 - .3 by labour and material costs submitted in a detailed quotation.
- .2 In the case of changes in the Work to be paid for under the time and material or the unit price methods, the form of presentation of costs and methods of measurement shall be agreed to by the Consultant and Contractor before proceeding with the change. The Contractor shall keep accurate records, as agreed upon, of quantities or costs and present

an account of the cost of the change in the Work, together with vouchers, material receipts and invoices where applicable.

- .3 In the case of changes in the Work to be paid for under the time and material or the labour and material method, the material costs are to be less trade discounts. The discount to be provided from list price for items included in the Allpriser catalogue or Electrical Price Guide is 20%.
- .4 The detailed quotation referenced under the labour and material method is to include a summary of charges made up of three components: labour charges, material costs and fees.

.1 Labour Charges

- (a) The labour hour estimates are to be based on the current NECA Column 2 manual of labour units.
- (b) Labour costs are to include burden on wages such as taxes, worker compensation charges, CPP, EI, project insurance, safety meetings, estimating, as-built drawings, supervision, small tools, site facilities, labour warranty and clean up.
- (c) The all inclusive hourly labour rate applicable for quotations submitted for changes to the work is 1.90 times the BASE RATE of the current Collective Agreement (ie if current rate for a Journeyman Electrician is $\$31.70 \times 1.9 = \60.23 per hour per hour. The hourly labour rate for specialists not governed by union agreements (technicians or engineers) is 2.25 times the base rate for Electricians.
- (d) The all inclusive hourly labour rate indicated above is to include:
- Collective Agreement relevant to the place of work (vacation pay, RRSP, Health & Welfare, RST of Health & Welfare, Pension, Union admin fund, ECA fund (or others), Secretariat.)
 - Legislation as relevant to the place of work (Emp. Health Tax, E.I., CPP, WSIB, taxes)
 - Project insurance, safety meetings, estimating, lay outs, site facilities, warranties, storage,
 - clean up, office supervision and miscellaneous charges.
- (e) Foreman Electrician, General Foreman, Superintendent rates shall be as for the calculated Journeyman rate above plus 15% of the base rate. A maximum of 10% of the total calculated journeymen hours on a change may be charged as overhead supervision hours at the Foreman rate.
- (f) A maximum combined amount of 3% of the total calculated journeymen hours on a change may be charged as overhead supervision hours at the General Foreman / Supervisor rate.
- (g) No other overhead supervision hours will be permitted.

.2 Material Charges

- (a) Material costs are to be less trade discounts. The discount for items included in the Allpriser catalogue or Electrical Price Guide is 20%.

.3 Fees

- (a) The overhead and profit fee is to include for the Contractor's head office and site office expenses, project manager, assistants, site office and storage facilities, utility charges, site security, telephone and facsimile transmission costs, As Built, expendable small tools, financing costs, coffee breaks, site facilities, general clean up and disposal, security, storekeeper, and all other non-productive labour.
- (b) Contractor is allowed a combined overhead and profit fee of 15% for work to be performed by his own forces.
- (c) Contractor is allowed an overhead and profit fee of 5% for work performed by a Sub-Contractor

- (d) Sub-Contractor is allowed an overhead and profit fee of 0% for work performed by a Sub-Subcontractor.

PART - 7 CONSULTANT REVIEWS

7.1 GENERAL

- .1 Consultant's attendance at site including but not limited to site meetings, demonstrations, site reviews and any resulting reports are for the sole benefit of the Owner and the local authority have jurisdiction.

7.2 SITE REVIEWS

- .1 General reviews and progress reviews do not record deficiencies during the course of the Work until such time as a portion or all of the work is declared complete. In some instances before the work is completed, deficiencies may be recorded where the item is indicative of issues such as poor workmanship, incorrect materials or installation methods, or may be difficult to correct at a later date. Any such reported items, or lack thereof, shall not be relied on in any way as part of the Contractors quality assurance program nor relieve the Contractor in the performance of the Work.
- .2 Deficiency reviews conducted by the Consultant are performed on a sampling basis, and any deficiency item is to be interpreted as being indicative of similar locations elsewhere in the Work, unless otherwise shown.
- .3 Milestone Reviews
 - .1 Specific milestone reviews are conducted at key stages by the Consultant, including:
 - (a) Before backfilling of buried drainage,
 - (b) Before closing of shafts
 - (c) Before closing of ceilings
 - (d) Before closing of walls
 - (e) Equipment demonstration
 - (f) Substantial Performance deficiency review
 - (g) Total Performance deficiency review.
 - .4 Coordinate with the Consultant the type and quantity of milestone reviews required and incorporate these requirements in the construction schedule.
 - .5 Notify the Consultant in writing seven (7) calendar days in advance of work to be concealed to arrange a site review prior to the Work being concealed. Any noted deficiencies are to be corrected and reviewed again by the Consultant before being concealed. Failure to provide notification can result in the Work being exposed for review at the Contractor's cost.

PART - 8 CONTRACTOR DUTIES DURING INSPECTION

- .1 Inspection from the Consultant's team will be provided in accordance with Regulation 941/90 of the Professional Engineers Act. Inspections will be performed on a periodic basis to ensure general compliance only. Unscheduled random inspections and scheduled pre-occupancy inspections will be conducted to ensure installation generally meets specified quality standards and intent of the design according to the Ontario Building Code. Not all work will be inspected as walls and ceilings are closed in and buried services covered to meet schedule deadlines. It is the Contractor's responsibility to ensure that work is complete and constructed to specified standards.
- .2 The Division 26 Contractor shall each assign one person responsible for ensuring that work from all Division trades is complete prior to closing in wall, ceilings or burying services, and prior to Pre-occupancy Inspections. In conjunction with the Mechanical and Electrical Co-ordinator, the Contractor shall walk the site and thoroughly review that the work is

complete, in good workmanship and installed according to the drawings and specifications. The Contractor shall then submit a "Statement of Completion" Report. In the case of pre-occupancy inspections, the Statement of Completion report will be submitted 24 hours prior to the scheduled Inspection.

- .3 Services to be covered (behind drywall or buried) shall be photographed and assembled in a journal to form a comprehensive documentation of the completed services. The photos will be turned over to the Inspector for review prior to pre-occupancy inspection and will again be turned over to the Owner for his use at the end of the Project.
- .4 In preparation for the pre-occupancy inspection of the area or phase being turned over to the Owner, the Division Contractor shall perform a comprehensive inspection of their own to ensure that their contractual obligations are met before requesting the pre-occupancy inspection. The written report or Statement of Completion shall consist of the following items:
 - .1 date and time of the inspection, signed by the person who conducted the inspection
 - .2 confirmation that previously noted deficiencies have been completed
 - .3 confirmation that the work is 100% complete, tested, balanced and deficiency free or include a list of outstanding work with a reason why work has not been completed (ie another trade has to complete their work)
 - .4 a plan of action to complete in-complete work with estimate of completion time.
- .5 The format of the Statement of Completion will be agreed upon with the Consultant. The Consultant's Inspector shall sign off the Statement of Completion Report and return a copy to the Contractor. The Contractor will retain on site a log of all signed off Statement of Completion reports.
- .6 If Statement of Completion is not received, the Consultant reserves the right to withhold pre-occupancy inspection.
- .7 If the Statement of Completion is received and the Inspector enters an area that is obviously not ready for inspection (ie the report was falsified), the Inspector shall immediately leave the site without completing the inspection. The Division Contractor shall request another inspection 72 hours in advance and shall resubmit the Statement of Completion 24 hours prior to the inspection.

PART - 9 CORRECTION AFTER COMPLETION

9.1 GENERAL

- .1 At completion, submit written guarantee undertaking to remedy defects in work for a period of one year from date of substantial completion. This guarantee is not to supplant other guarantees of longer period called for on certain equipment or materials.
- .2 Guarantee to encompass replacement of defective parts, materials or equipment, and to include incidental fluids, gaskets, lubricants, supplies, and labour for removal and reinstallation work.
- .3 Submit similar guarantee for one year from date of acceptance for any part of work accepted by Owner, before completion of whole work.

9.2 FINAL REVIEW

- .1 At project completion submit written request for final review of mechanical and electrical systems.
 - .1 Refer to section 26 08 19 Project Close-Out.



H.H. Angus & Associates Limited Consulting Engineers

SHOP DRAWING COVER SHEET

1127 Leslie Street Toronto Ontario M3C 2J6 Canada

T: (1) 416 443 8200 F: (1) 416 443 8290

***Include this cover page with each shop drawing submission.
Submissions without this form will be returned without review.***

Client/Architect: **ABC Architects Ltd**
Project Name: **University Healthcare Wing**
HHA Project No: **2081001**

Contractor to complete the following for each submission.

Date: _____

Contractor Reference No: _____

Manufacturer Name: _____

Product Type: _____

Specification Section No: _____

Contractor Trade:

Mechanical Electrical Elevators General Trades

If this is a resubmission, check here:

Previous submission reference no.: _____
(HHA reference No. only)

HHA distribution - for internal use only:

Mechanical review: John Smith

Electrical review: Joan Smith

Elevators review:

END OF SECTION

PROJECT PHASING

26 05 05

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.

1.2 REFERENCE PHASING REQUIREMENTS

- .1 Portions of the Work impact on the existing hospital. Notify the Owner and the Consultant, in writing, at least one week in advance of the work where work requires shut-down or isolation of existing services.
- .2 Except as identified below, shut-downs of existing services will be restricted to the hours from 10:00 PM to 5:00 AM.
- .3 The Contractor shall be responsible for isolation of applicable systems under strict supervision from Hospital Staff. The Contractor shall be responsible for temporary services as required to suit their work.
- .4 Access to the existing ceiling spaces is to be considered hazardous due to possibility of Infection Controls concerns. Entry is restricted and Contractors shall comply to the hospitals Health and Safety regulations for work in this area. Arrange with Health and Safety at least 48 hours prior to access. All members of construction crew must be trained in Infection Controls procedures.
- .5 Carefully examine the phasing plan from the Architectural drawings and develop an Electrical construction plan to ensure all services will be complete and available for occupancy of the phased spaces. Route all services within the boundaries of the phased areas to ensure services are ready when required for occupancy.
- .6 The Electrical work necessary to maintain services will not be restricted to the architectural phased areas of work. This Division will have work in the existing building, obtaining and modifying services for new phased areas.
 - .1 The Contractor shall maintain existing systems until the new services are ready for use. In some areas provide additional feeders, lighting, circuits, wiring, etc as required to maintain services in phased areas. Remove temporary redundant Electrical services used for phasing at end of project.
 - .2 In new work, provide temporary Electrical services and connections between phased areas to avoid un-necessary system shutdowns.

1.3 WORK IN OCCUPIED AREAS

- .1 Work in Owner occupied areas to be scheduled with the Hospital. Access to these area will be during after normal working hours; schedule the work with the hospital for availability of work areas.
- .2 The phasing of the construction work as recommended has been coordinated with the Client and meet the Hospital's need to maintain the life activities operational during construction work. The General Contractor will schedule the construction work to meet the requirements of starting completing the work as per the phasing listed in the Contract Documents.

1.5 **PHASED OCCUPANCY, EQUIPMENT MAINTENANCE, EQUIPMENT OPERATION AND WARRANTEE.**

- .1 *Although there are several phases to this project, it is one project and substantial performance will be granted at the end of the project. There will be no phased substantial performance or phased release of holdback.*
- .2 *The Electrical Contractor to ensure Lighting Systems, UPS Systems (if included in the Construction) are operational for the appropriate phase of construction.*
- .3 *The Electrical Contractor will be responsible to maintain and operate the new equipment (and systems) supplied under this project until the project is formally handed over to the Owner. Maintenance shall include all manufacturer recommended maintenance and cleaning. Maintenance and system downtime to be minimized and scheduled to suit the Hospital.*
- .4 *The Electrical Contractor shall operate the systems to the Owners benefit to ensure that the occupied phases are fully serviced to the Owners schedule. Provide a list of emergency contacts so they can respond 24/7 to issues with their system. Repairs to be made quickly to minimize disruption to the Hospital.*
- .5 *Training of Owners maintenance personnel to be done at end of project prior to formal turnover to Hospital. Training will not be required at the end of each phase as the contractor will be maintaining and operating the equipment/systems installed under this project.*
- .6 *Equipment and system warranties to start after substantial performance even though equipment may be operating during early phases. **Notify equipment supplier of this situation during bidding and include any additional costs related to operating the equipment during the construction period or include extended equipment warrantee to cover contract duration plus the standard warrantee period starting after substantial performance.***

END OF SECTION

FIRE STOPPING & SMOKE SEALS

26 05 10

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with the General Conditions of the Contract, Supplementary Conditions and other Sections of Division 1 and with Section 26 05 01, Electrical General Requirements.

1.2 SYSTEM DESCRIPTION

.1 Work of this Section comprises firestopping materials and/or systems to provide closures to fire at openings around penetrations, at un-penetrated openings, at projecting or recessed items, and at openings and joints within fire separations and assemblies having a fire-resistance rating, including openings and spaces at perimeter edge conditions.

.2 Work of this Section also comprises smoke sealants applied over firestopping materials or combination smoke seal/firestop seal material to form air tight barriers to retard the passage of gas and smoke.

.3 The installed firestopping/smoke sealant system shall provide and maintain a fire-resistance rating equivalent to the rating of the adjacent floor, wall or other fire separation assembly to the requirements of and as acceptable to the authorities having jurisdiction and to the Consultant.

.4 Firestopping and smoke seals within electrical assemblies (i.e. inside electrical cable ducts/ trays if applicable) shall be provided as part of the Work of Divisions 26. Refer to Section 26 05 01, Article 5.4 and include firestopping and smoke seals around the outside of such mechanical and electrical assemblies where they penetrate fire-rated separations shall be part of the Work of this Section unless otherwise indicated by the Contractor.

.5 Confirm locations of exposed/non-exposed fireproofed surfaces with consultant prior to application.

.6 Penetrations will have single or multiple conduits passing through and Work will consist of firestopping all penetrations with pre-approved ULC assemblies.

1.3 RELATED SECTIONS

.1 Sealing around service penetrations through rated floors and walls - under Division 26, Division 27 and Division 28.

1.4 QUALITY ASSURANCE

.1 Provide experienced and competent installers, trained by material or system manufacturer.

.2 Applicator Qualifications:

.1 Applicator shall have at least three years experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.

.2 Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.

.3 Applicator shall be approved for this Work by Product Manufacturer or listed below:

(a) Beverly F.S. (Tel: 905-659-3367)

- (b) Dominion Caulking (Tel: 905-883-8355)
 - (c) Profirestop (Tel: 416-293-0993)
 - (d) RILI Firestopping (Tel: 905-349-3779)
- .4 Obtain firestop materials from single manufacturer for each different product required.
- .5 Manufacturer shall instruct applicator in procedures for each material.
- .6 Refer to notes on Drawings for additional information, instructions and clarifications.
- 1.5 **REGULATORY REQUIREMENTS:**
- (a) Firestop System installation must meet requirements of CAN/ULC-S 115-11 tested assemblies that provide a fire rating equal to that of construction being penetrated.
 - (b) Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
- 1.6 Arrange a pre-job conference between Contractor, applicator, inspection and testing representative, manufacturer's representative and Consultant.
- 1.7 Fire Protection Consultant will test (Review) up to 2% of completed Work (Penetrations). Contractor to provide installer and enclosures at Consultant's discretion.
- 1.8 Consultant may or may not require destructive testing to be done. Contractor shall cover costs of repairing fire separation after destructive tests are performed.
- 1.9 **SUBMITTALS**
- .1 Shop Drawings
- .1 Submit drawings indicating the ULC or Warnock Hersey assembly number, the required temperature, hose stream, and flame rating, material thicknesses, installation methods and materials of firestopping and smoke seals, primer, supports, damming materials as applicable, reinforcements, anchorages, fastenings and methods of installation for each condition to be encountered.
- .2 Designate on shop drawings both fixed and moving penetrants, relative positions, expansion and control joints in rated slabs and walls, firestopping details at receptacles and similar poke-through devices and surrounding permanent materials. Identify re-entry locations.
- .3 Manufacturer's Product Data: Submit data for materials and prefabricated devices, providing descriptions sufficient for identification on Site.
- .4 Certificates: Submit manufacturer's certification that installed firestopping and smoke seal material comply with specified requirements.
- .5 ULC or Warnock Hersey Listings: Submit copies of Listing cards for review.
- .2 Samples
- .1 Submit only as requested various types of firestopping and smoke seal material.
- .2 Mock-Up
- 1. Construct mock-up for each separation type prior to commencing Work at locations as designated by Consultant in accordance with Section 01 00 00.
 - 2. Mock-ups shall be reviewed and approved by manufacturer and Consultant.

3. Accepted mock-ups may remain as part of completed work.
 4. Mock-ups shall be modified as many times as necessary to obtain acceptance.
- .3 Delivery, Storage and Handling
- .1 Deliver the materials to the job site in the manufacturer's unopened containers, containing the classification label, with labels intact and legible at time of use.
 - .2 Store material in accordance with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.
 - .3 Before handling, read product data sheets and material safety data sheets. Do not use damaged or expired materials.
- .4 Identification
- .1 Identify, through-penetration fire stopping and smoke seal systems with pressure sensitive, self adhesive, printed vinyl labels. Attach labels permanently to surfaces of penetration construction on both sides. Labels must be visible from 5'-0" above the floor. Labels must show the following information:
 - (a) the words "Warning: through-penetration firestopping system, Do not disturb"
 - (b) the applicators name, address and telephone number
 - (c) designation of applicable testing and inspection agency
 - (d) date of installation
 - (e) manufacturers name for materials
- .5 Photography
- .1 Provide digital photography of every fire separation penetration showing both the before and after installations. Picture must indicate day and time and be labelled to show exact location.
 - .2 Duplicate copies of digital photo records are to be submitted directly to the Hospital at the completion of the installation in each building/ wing.

PART - 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS / INSTALLATION SPECIALISTS

.1 General

.1 Manufacturers of firestopping products and installation specialist for this Work are limited to applicable assemblies as required for Project and having ULC or C-UL-US or Warnock Hersey labelled packaging.

.2 Approved manufacturers:

- (a) 3M Canada
- (b) A/D Fire Protection Systems Inc
- (c) Grace
- (d) Nuco Inc. (1-800-583-3984)

(e) Tremco Canada

2.2 MATERIALS

- .1 Firestopping and smoke seals shall conform to the following:
 - .1 Asbestos free materials and systems.
 - .2 Provide a fire-resistance rating not less than the fire-resistance rating of the surrounding or adjacent floor, wall or other assembly.
 - .3 FTH Rated and certified in accordance with CAN/ULC-S115-95, and be labelled (WH, cUL, ULC).
- .2 Sealants and putty for overhead and vertical joints shall be non-sagging; seals for floors, self-levelling, silicone based.
 - .3 Products shall be compatible with abutting dissimilar architectural coatings and finishes at floors, wall, ceiling, waterproofing membranes and the like. Check with requirement of Contract Documents and manufacturer of selected materials being installed.

PART - 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with manufacturer's product data including product technical bulletins, product catalogue installation instructions and product packaging instructions.

3.2 PREPARATION

- .1 Examine sizes, anticipated movement and conditions to establish correct thickness and installation of back-up materials.
- .2 Clean bonding surfaces to remove deleterious substances including dust, paint, rest, oil, grease, moisture, frost and other foreign matter which may otherwise impair effective bonding.
- .3 Remove insulation from insulated pipe and duct where such pipes or ducts penetrated a fire separation unless listed assembly permits such insulation to remain within the assembly, or where mechanical trades have installed special fire rated insulated sleeves.
- .4 Prepare surfaces, prime, mask adjacent surfaces and clean in accordance with manufacturer's directions and to requirements of tested assembly.

3.3 INSTALLATION

- .1 General
 - .1 Mix and apply firestopping, gas and smoke seals in strict accordance with manufacturer's instruction and tested designs to provide required flame rated seal, to prevent the passage of gas and smoke, and where specifically designated, the passage of fluids.
 - .2 Provide temporary forming and packing as required. Apply materials with sufficient pressure to properly fill and consolidate the mass to seal openings.
 - .3 Tool or trowel exposed surfaces.
 - .4 Notify Consultant when random completed installations are ready for review, as directed by Consultant, prior to concealing or enclosing firestopping and as applicable, smoke seals.

3.4 IDENTIFICATION

- .1 Provide identification of all firestopping as specified.

3.5 PHOTOGRAPHY

- .1 Provide digital photography of every fire separation penetration showing both the before and after installations. Picture must indicate day and time and be labelled to show exact location.

.2 Duplicate copies of digital photo records are to be submitted directly to the Hospital at the completion of the installation in each building/ wing.

3.6 **CLEAN UP**

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application. Remove and or correct staining and discolouring or adjacent surfaces as directed.

END OF SECTION

WIRES & CABLES 0-1000 VOLTS

26 05 19

PART - 1 GENERAL

1.1 PRODUCT DATA

- .1 Submit product data in accordance with Section 26 05 01 Electrical General Requirements.

PART - 2 PRODUCTS

2.1 BUILDING WIRES

- .1 Copper conductors: size as indicated, stranded for 10 AWG and larger, with 1000 V insulation for 347/600 Volt systems, and 600 V insulation for 120/208 V systems, of chemically cross-linked thermosetting polyethylene material rated RW90 and/or RWU90 to CSA C22.2 No. 38.
- .2 Use RWU90 for wiring installed underground.
- .3 Wiring in channel back of luminaires shall be 600 volt type GTF or TEW, temperature rating as required by CSA and/or manufacturer requirements..
- .4 Conductors shall be colour coded. Conductors No. 10 AWG and smaller shall have colour impregnated into insulation at time of manufacture. Conductors No. 8 AWG and larger may be colour coded with adhesive colour coding tape but only black insulated conductors shall be employed in this case, except for neutrals which shall be white wherever possible.
- .5 Minimum wire size shall be No. 12 AWG. Home runs to lighting and receptacle panels which exceed 25 m (75') in length shall be minimum No. 10 AWG. Home runs which exceed 40 m (120') in length shall be minimum No. 8 AWG. Home runs which exceed 60 m (180') in length shall be minimum 6 AWG.
- .6 Colour coding shall be as follows: Red - Phase A, Black -Phase B, Blue - Phase C, White - Neutral, Green - Ground, Orange - Control.

Standard of Acceptance

- o Aetna Insulated Wire
- o General Cable
- o Nexans Canada Inc
- o Pirelli Cables Ltd.
- o Southwire

2.2 MINERAL INSULATED CABLE

- .1 Cable shall have ULC listed 2 hour fire rating.
- .2 Cable shall be shipped with ends temporarily sealed and shall be stored under dry conditions.
- .3 Cable shall be of capacities and types noted on drawings and shall be terminated using suitable terminating hardware.

Standard of Acceptance

- o Pyrotanax

2.3 INSTRUMENTATION AND CONTROL CABLING

- .1 Control cables shall be designed according to CSA Standard Can3-C2.1-M86 Control Cables - 600 Volts.

.2 Control cables shall be as follows:

Conductors	Quantity, arrangement and gauge shown on drawings or specified elsewhere
Identification	Colour coded or numbered
Insulation	XLPE
Armour	Steel (No armour required if installed in conduit or approved wireway)
Jacket	FT4 Flame Retardant PVC FT6 Plenum rated in open style cable trays in ceiling spaces

.3 Shielded cables shall provide 100% shield coverage and be complete with drain wire.

.4 Multipair twisted shielded cables shall have individual pairs shielded, overall shield and drain wires and overall rated jacket.

Standard of Acceptance

- o BICC
- o Belden
- o Nexans Canada Inc

PART - 3 EXECUTION

3.1 GENERAL

.1 Provide grounding / bonding conductor in all conduits whether metallic or non-metallic, sized as per Ontario Electrical Safety Code, and connect to grounding bus. All receptacles, lighting fixtures, panels, transformers, motors, heaters, communications conduits and other powered devices shall be grounded via ground wires.

.2 A dedicated neutral conductor shall be provided for each single phase branch wiring power circuit.

3.2 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 33.

.2 In wireways and auxiliary gutters in accordance with Section 26 05 37.

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

.3 Splice wire, up to and including No. 6 AWG with nylon insulated expandable spring type connectors. Connector body shall be moulded of thermoplastic and spring insert shall be an expandable square-edged design. Splice larger conductors using split-bolt or compression type connections wrapped with PVC tape.

.4 Where colour coding tape is utilized, it shall be applied for a minimum of 50 mm (2") at terminations, junction and pullboxes. Do not paint conductors under any conditions. Colour coding shall also apply to bussing in panels and bus duct.

3.3 INSTALLATION OF MINERAL INSULATED CABLES

.1 Cable shall be installed in trays or exposed on walls, beams, purlins or ceilings, using clamps available from the manufacturer. Fire rated circuits shall be supported on centres not exceeding 1000 mm (3'). Care shall be taken when handling the cable to avoid cable kinks; it is recommended that cable be

uncoiled from supply reel by rolling. Cables shall be bent using a suitable hickey with a minimum bending radius of six times the cable diameter.

- .2 Embedded cables shall be protected against punctures and mechanical damage.
- .3 Single conductor cables forming part of a circuit shall be run in contact with one another throughout their length.
- .4 Single conductors in parallel shall be arranged in groups and the groups shall be at least two cable diameters apart.
- .5 Cables shall be terminated with manufactured gland and seals. Gland and seal assembly shall be prepared with tools specifically designed for the purpose. Upon completion of termination, the insulation resistance of the cable shall be checked with an insulation tester in accordance with values to be determined by the [Engineer][Consultant].
- .6 Cables forming part of circuits rated 200 A and above shall be terminated at each end on a suitably sized minimum 6 mm thick brass plate, installed by removing the steel of the termination panel. A copper bonding conductor, sized per Table 16 of the Safety Code, shall be connected to the termination plate via a Burndy Servit type KC connector or type YA compression connector, and extended to the equipment ground bus and terminated with a Burndy YA compression connector with 12mm stainless steel bolt and hardware.
- .7 The entire installation shall be made in accordance with the recommendations of the manufacturer, who shall be retained by the Contractor under this Section to inspect the cable installation and termination methods.

3.4 **INSTALLATION OF INSTRUMENTATION, COMMUNICATION AND CONTROL CABLING**

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 33.
 - .2 In wireways and auxiliary gutters in accordance with Section 26 05 37.
 - .3 In open style corridor cable trays in ceiling spaces, using FT6 plenum rated cable assemblies.
- .2 Neatly train circuit wiring in cabinets, panels, pullboxes and junction boxes and hold with nylon cable ties.
- .3 Run all instrumentation, communication and control cabling point to point and terminate on terminal strips. Do not splice communication or control cabling. Where long runs make a continuous point to point installation impractical, make splices on labelled terminal blocks installed in an accessible labelled terminal cabinet, installed at 1200 mm (48") above floor, and indicate cabinet location, terminal And wire numbers on As-built drawings.
- .4 Terminate control cables in equipment with suitable connectors.
- .5 All control cables shall be clearly identified, at both ends, with permanent PVC wire markers, Electrovert type Z or equal, indicating Cable Number and wire numbers.

END OF SECTION

GROUNDING SECONDARY
26 05 27

PART - 1 GENERAL

1.1 REFERENCES

- .1 IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.
- .2 CSA C22.1 Electrical Safety Code
- .3 CSA-Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

1.2 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.
- .2 Conform to Section 26 05 01, Electrical General Requirements.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 26 05 01 Electrical General Requirements.
- .2 Nameplates shall be in accordance with Article "Equipment Identification".

1.4 WORK INCLUDED

- .1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete systems as shown as specified and as otherwise required.

1.5 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 26 05 01 Electrical General Requirements.

PART - 2 PRODUCTS

2.1 EQUIPMENT

- .1 Clamps for grounding of conductors, size as required to electrically conductive underground water pipe.
- .2 Insulated grounding conductors: green, type RW90 copper.
- .3 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 Thermit welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

- .4 Perimeter ground bus, 6 mm x 50 mm (¼" x 2") copper, mounted 150 mm (6") above floor on insulated spacers 600 mm (24") on centre.
- .5 Ground bus mounting spacers
 - .1 stand off insulators to UL 891
 - .2 25 to 32 mm high waterproof glass fibre reinforced polyamide
 - .3 750V insulated
 - .4 UL 94VO self extinguishing
 - .5 bichromated zinc plated threaded steel inserts
 - Standard of Acceptance*
 - Erico ISO I series c/w insulator mounting kits
 - Approved equal
- .6 Communication and Computer room raised floor ground clamps: Burndy Uniground

PART - 3 EXECUTION

3.1 INSTALLATION

- .1 Install complete permanent, continuous, system and circuit, equipment, grounding systems including, electrodes, conductors, connectors, accessories, as indicated, to conform to requirements of local authority having jurisdiction over installation.
- .2 Ground electrical equipment and wiring in accordance with Ontario Electrical Safety Code and ANSI/IEEE Standard 142-1982.
- .3 Install connectors in accordance with manufacturer's instructions.
- .4 Protect exposed grounding conductors from mechanical injury.
- .5 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process.
- .6 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .7 Soldered joints not permitted.
- .8 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.
- .9 Install separate ground conductor in all conduits. Ground conductor shall be sized as per Table 16 of CSA C22.1 with one ground conductor for every three hot conductors. Minimum size of ground conductor shall be #12 AWG copper.
- .10 Connect building structural steel and metal siding to ground by welding copper to steel.
- .11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .12 Install grounding conductors outside electrical rooms and electrical closets in conduit and conceal where possible.
- .13 Provide separate ground wire for every feeder, sized as per Table 16 of the OESC.

3.2 **ELECTRODES**

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter. Install water meter shunt.
- .2 Install [rod], [plate] electrodes and make grounding connections.
- .3 Provide rod electrodes at corners of main electrical room and connect to perimeter ground bus.
- .4 Bond separate, multiple electrodes together.
- .5 Use size 4/0 AWG copper conductors for connections to electrodes.
- .6 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails.

3.3 **SYSTEM AND CIRCUIT GROUNDING**

- .1 Install system and circuit insulated copper grounding connections to neutral of secondary systems and for common grounding conductors per CSA C22.1 Table 17.
- .2 Install insulated copper grounding conductor for service raceways and service equipment per CSA C22.1 Table 18.
- .3 Install grounding conductors in conduit.

3.4 **EQUIPMENT GROUNDING / BONDING**

- .1 Install insulated copper bonding connections per CSA C22.1 Table 16 to typical equipment including, but not necessarily limited to following list: Service equipment, transformers, frames of motors, starters, control panels, building steel work and panels, outdoor lighting.
- .2 Install bonding conductors in conduit.

3.5 **COMMUNICATIONS SYSTEMS**

- .1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
 - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
 - .2 Communications system grounding in accordance with ANSI/EIA/TIA 607, 568A, 569 standards.
 - .3 Sound, fire alarm, intercommunication systems as indicated

3.6 **RAISED FLOOR GROUNDING**

- .1 Install [#2] [#6] bare copper grounding conductors in a grid pattern on four foot centres in each direction of the floor grid. Install Burndy Uniground ground clamp to raised floor pedestals on four foot centres, at each intersection of the ground grid conductors.
- .2 Bond each item of equipment on the raised floor to the raised floor ground grid with minimum #6 tinned copper flat braid extra flexible bonding jumper.
- .3 Extend #1/0 green insulated copper ground conductor in EMT conduit from ground grid to the building main grounding system. Terminate using NEMA 2 hole compression connectors.

3.7 **PERIMETER GROUND BUS**

- .1 Provide exposed perimeter ground bus in main electrical rooms and generator room.
- .2 Mount on stand off insulated spacers to wall using zinc plated steel studs, washers, lock washer and nuts.
- .3 Connect exposed metal work in electrical rooms and generator room to perimeter ground bus with insulated stranded copper connections, size 2/0 AWG copper in conduit.
- .4 Protect ground bus with one coat of insulating varnish.

3.8 **FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 01 - Electrical General Requirements.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

END OF SECTION

FASTENINGS AND SUPPORTS

26 05 29

PART - 1 GENERAL

1.1 RELATED WORK

- .1 Fastenings and supports: Section 01 61 00 - Common Product Requirements.
- .2 Concrete bases and housekeeping pads for electrical equipment shall be arranged and paid for by Division 26, and installed by trade specialists under respective Carpentry, Concrete, and Painting Divisions.

1.2 SHOP DRAWINGS

- .1 Submit design drawings for custom fabricated trapeze hangers, sealed by a professional engineer licensed in the project location jurisdiction.
 - .1 Shop drawing details:
 - (a) construction detail drawings for each loading condition,
 - (b) span deflection calculations,
 - (c) building attachment load calculations and type.
 - .2 Provide services of engineer who sealed the custom trapeze hanger shop drawings to conduct a general review of the completed installation on site.

PART - 2 PRODUCTS

2.1 SUPPORT CHANNELS

- .1 Hot dipped galvanized steel, U shape, size 41 mm x 41 mm x 2.5 mm (1e" x 1e" x 1/10") thick, surface mounted, suspended or set in poured concrete walls and ceilings.

2.2 INSERTS

- .1 Inserts for conduits and raceway hangers, for single, double and multiple runs shall be galvanized.

Standard of Acceptance

- Unistrut Canada
- Burndy (Canada) Ltd. - Flexibar
- Pilgrim Technical Products Ltd. - Tufstrut

2.3 HANGERS

- .1 Hangers for electrical conduit shall be hot dipped galvanized after fabrication.

Standard of Acceptance

- Burndy Canada Ltd.
- Canstrut
- Electrovert Ltd.
- E. Myatt & Co. Ltd
- Steel City Electric Ltd.

- Pilgrim Technical Products Ltd.

2.4 **TRAPEZE HANGERS**

.1 Performance:

.1 Manufactured:

- (a) to product load listings.

.2 Custom fabricated:

- (a) maximum deflection between supports: 1/250 (0.4%) of span
- (b) minimum factor of safety : 5 times load to ultimate tensile or compressive strength.

.2 Construction:

.1 Carbon steel shapes, to suit load application:

- (a) hollow steel section,
- (b) equal leg EI section, or
- (c) double C channel "strong-back", with welded clips.

.2 Hanger rods:

- (a) as specified above, and
- (b) minimum two support rods,
- (c) rods selected for minimum factor of safety of 5 times load to ultimate tensile or compressive strength of rod.

.3 Finish:

- .1 hot dipped galvanized finish in mechanical rooms and outdoors.
- .2 black steel finish in other areas.

Standard of Acceptance

- Anvil Fig 45, 46, 50

PART - 3 EXECUTION

3.1 **INSTALLATION**

- .1 Supply and deliver inserts to site in ample time to be built into work of other trades. Provide necessary templates and adequate instructions to locate and install inserts.
- .2 Secure equipment to masonry, tile and plaster surfaces with lead anchors.
- .3 Secure equipment to poured concrete with expandable inserts.
- .4 Secure surface mounted equipment with T-bar support hanger fastened to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

Standard of Acceptance

- Caddy model No. 512 c/w BHC clip

- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm (2") and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm (2").
 - .3 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm (¼") dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm (¼") dia threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels.
- .9 Provide galvanized after fabrication metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of [Engineer][Consultant].
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .14 Supply and erect special structural work required for the installation of electrical equipment. Provide anchor bolts and fastenings unless noted otherwise. Mount equipment required to be suspended above floor level, where details are not shown, on a frame or platform bracketed from the wall or suspended from the ceiling. Carry supports to either the ceiling or the floor, or both as required, at locations where, because wall thickness is inadequate, it is not permitted to use such brackets.
- .15 Electrical panels, switches or other electrical equipment shall be complete with suitable bases or mounting brackets. Install angle or channel iron supports to bear the equipment where it is shown in or on structural tile walls, or walls that are inadequate to bear the equipment.
- .16 Provide channel iron or other metal supports where necessary to adequately support lighting fixtures. Do not use wood. Lighting fixtures shall be supported totally independent of ceiling and supported from structure above.
- .17 Support hangers, in general, from inserts in concrete construction or from building structural steel beams, using beam clamps. Provide additional angle or channel steel members required between beams for supporting conduits.
- .18 Do not use explosive drive pins in any section of work without obtaining prior written approval.

- .19 Provide re-enforced concrete pads under switchboards, generators, and all other floor mounted electrical equipment. Pads are to formed with chamfered edges to prevent chipping. Pads are to be sealed and painted to prevent dust from entering and interfering with electrical equipment.

END OF SECTION

SPLITTERS, JUNCTION AND PULL BOXES, CABINETS
26 05 32

PART - 1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data for cabinets in accordance with Section 26 05 01 Electrical General Requirements.

1.2 REFERENCE

- .1 CSA C22.2 No. 76 Splitters.
- .2 CSA C22.2 No. 40 Junction and Pull Boxes.
- .3 Cabinets to Section 26 27 18 Panel Trim.

PART - 2 PRODUCTS

2.1 SPLITTERS

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Main and branch lugs and connection bars 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.
- .4 Distribution riser splitters shall be of special construction with hinged access door, copper bus bars predrilled to accept two hole compression connectors for all incoming and outgoing cables.

2.2 JUNCTION AND PULL BOXES

- .1 Welded steel hot dipped galvanized 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.

2.3 CABINETS

- .1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.
- .2 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing sheet steel backboard for surface or flush mounting as indicated.
- .3 Surface mounted cabinets shall be finished in ASA 61 grey.

2.4 INSTRUMENTATION AND CONTROL TERMINAL CABINETS

- .1 Surface mounted, gasketed, drip proof and dust tight, JIC enclosure, CEMA type 12 With hinged door, lock, 2 keys, white raised and removable internal mounting panel, diagram pocket, finished with ASA 61 grey.

Standard of Acceptance

 - Hammond
- .2 Panel wiring to be contained in PVC wiring ducts complete with cover strips, minimum 50 mm x 50 mm (2" x 2"). Wireway fill to be limited to 60%. Where there are a large number of door mounted devices, door wiring harnesses shall also be contained in wiring ducts at rear door. All door wiring devices to emanate from the control panel terminal strips. Wiring to panel face mounted devices to be bundled neatly on hinge side of panel, enclosed in flexible spiral wrap, and installed such that wiring will not be damaged when opening and closing door. Ground panel door to panel with a flexible copper bonding strap. Label all wiring with permanent PVC sleeve type markers.
- .3 Phoenix contact terminal blocks with mounting rails, end covers, terminal markers, partition plates and accessories: UK 2.5 termination of wiring 22 to 12 AWG; UK 5 and UK 10 series for current transformers and other leads #10 AWG and #8 AWG; UDK or UK 5 twin for connecting two or more conductors to one terminal block; DIK 1.5 for three wire sensor device wiring; MTKD for thermocouple leads.
- .4 Provide lamacoid nameplates for all panel mounted control and indicating devices, and all internal components such as terminal strips, control transformers, control devices, relays, etc. as per 26 05 01.

PART - 3 EXECUTION

3.1 SPLITTER INSTALLATION

- .1 Install splitters and mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m (6'-6") above finished floor.
- .3 Install terminal block as indicated in Type T cabinets
- .4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m}{100'} of conduit run between pull boxes.

3.3 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Electrical - General Requirements.
- .2 Install size 2 identification labels indicating system name, voltage, phase and source of power.

- .3 Provide a typed directory in cabinets showing following information: Nature, actual quantities and room number of device or devices connected to each terminal, as well as signal circuit number where applicable.

END OF SECTION

CONDUITS, FASTENINGS AND FITTINGS

26 05 33

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.
- .2 Conform to Section 26 05 01, Electrical General Requirements.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 26 05 01 Electrical General Requirements.

1.3 WORK INCLUDED

- .1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete systems as shown as specified and as otherwise required.
- .2 Location of Conduit
- .3 Drawings do not indicate all conduit runs. Those indicated are in diagrammatic form only.

1.4 REFERENCES

- .1 CSA C22.2 No. 83 Electrical Metallic Tubing
- .2 CSA C22.2 No. 56 Flexible Metal and Liquid-Tight Flexible Metal Conduit
- .3 Conduit accessories, conduits and fittings to CSA C22.2 No. 18.

1.5 WIRING METHODS

- .1 Install wiring in surface mounted EMT conduit unless otherwise specified. In finished areas, conceal conduit in walls and ceiling spaces.
- .2 Where shown on drawings, armoured cable shall be Teck 90 type. Jackets of cable shall have FT-4 rating identified. Connectors shall be equal to T&B Star Teck Type
- .3 Runs of conduit and cables, where shown, are indicated only by general location and routing. Install conduits and cables so as to provide maximum head room and to interfere as little as possible with free use of spaces through which they pass.
- .4 Use EMT conduit for branch circuit and signal wiring in ceilings, furred spaces, and in hollow walls and partitions.
- .5 Flexible conduit and armoured cable will be accepted in parts of existing building, where furred spaces above ceilings are too congested to permit conduit to be installed, but only with Consultants written permission. Terminate armoured cable, where shown, in accordance with the manufacturer's recommendations.

- .6 Flexible steel conduit with integral insulated green ground wire is permitted for the final connection to luminaires mounted in suspended ceilings from the branch wiring junction box above, with flexible conduit length not to exceed 3 m (10'), and be neatly installed and attached to luminaire support chain
- .7 Flexible armoured conduit (or BX) with an integral insulated green ground wire may be used where concealed in walls for wiring to receptacles, and for the final connection to luminaires.
 - .1 The junction box interfacing the horizontal EMT conduit to the flexible conduit shall be located within 3 m (10') horizontally from the end device in open areas, and in enclosed rooms, located in the same room as the devices being served, in reasonable proximity to the walls, in order to keep the horizontal portion of the run of flexible conduit to less than 3 m (10').
 - .2 The flexible conduit shall be neatly installed parallel or perpendicular to building lines, and independently supported from the slab structure above.]
- .8 Conduit shall be of sufficient size to permit easy removal of conductors at any time. Conduit sizes, where shown, are minimum and shall not be reduced.
- .9 Arrange conduits, installed in suspended ceilings, to provide minimum interference with removal of tiles.
- .10 Where existing locations of flush mounted electrical devices (switches, receptacles, etc.) correspond to new devices shown, the existing dropdown conduit and outlet box may be re-used. Provide new devices, new coverplates, new home-run conduit and complete new wire.
- .11 Vertical raceways to be provided with insulated cable support bushings or other approved method of supporting the weight of the cable, where vertical runs exceed those of Table 21 of the Electrical Code.

PART - 2 PRODUCTS

2.1 CONDUITS

- .1 Electrical metallic tubing (EMT), [hot dipped] galvanized: with couplings.
- .2 Flexible metal conduit and liquid-tight flexible metal conduit.
- .3 Conduit shall be of sufficient size to allow easy removal of conductors at any time. Conduit sizes, where shown, are minimum and shall not be reduced.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm (2") and smaller. Two hole steel straps for conduits larger than 50 mm (2").
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits.
- .4 Six mm dia threaded rods to support suspended channels.

2.3 CONDUIT FITTINGS

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

- .2 Factory "ells" where 90° bends are required for 25 mm (1") and larger conduits
- .3 Insulated throat steel set screw or raintight insulated throat steel compression] connectors and couplings for EMT.
- .4 Threaded or compression type raintight/concrete tight insulated throat zinc plated steel connectors and couplings for rigid steel conduit.
- .5 Raintight insulated throat steel connectors at all surface panelboards, switchboards and other electrical equipment in sprinklered areas for all conduit terminations.

2.4 **EXPANSION FITTINGS**

- .1 Electrogalvanized steel with internal grounding for EMT suitable for 100mm linear conduit movement.

Standard of Acceptance

- ° Cooper Crouse Hinds XJG-EMT
- .2 Weatherproof expansion fittings with internal bonding assembly suitable for 100mm (4") linear expansion.
- .3 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm (3/4") deflection in all directions.
- .4 Concrete type, water tight, corrosion resistant for conduit installations embedded in concrete
- .5 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 **FISH CORD**

- .1 Polypropylene

PART - 3 EXECUTION

3.1 **INSTALLATION**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .3 Use electrical metallic tubing (EMT).
- .4 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment
- .5 Install conduit sealing fittings in hazardous areas. Fill with compound.
- .6 Use raintight connectors or hubs for terminating conduits at all surface or floor mounted panelboards, switchboards, and other equipment located in sprinklered areas or where at risk of exposure to dripping liquids.
- .7 Install wiring in conduit unless otherwise specified.
- .8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

- .9 Mechanically bend steel conduit over 19mm (3/4") dia.
- .10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .11 Install fish cord in empty conduits.
- .12 Run two 25 mm (1") spare conduits up to ceiling space and two 25 mm (1") spare conduits down to ceiling space from each flush panel. Terminate these conduits in 152 x 152 x 102 mm (6" x 6" x 4") junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete type box.
- .13 Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.
- .14 Dry conduits out before installing wire.
- .15 Conduit manufacturer's touch up enamel shall be used to repair all scratches and gouges on epoxy-coated conduit.
- .16 Install junction boxes or cable anchor boxes wherever necessary for proper pulling or anchoring of cables. Install so as to be accessible after building is completed and set to come within finished lines of building.
- .17 Where EMT is used, run green insulated ground wire in conduit, with minimum one ground conductor per three ungrounded conductors.
- .18 Provide expansion couplings, with bonding jumper and ground clamps where raceways cross building control joints.
- .19 Runs of conduit and cables, where shown, are indicated only by general location and routing. Install conduits and cables so as to provide maximum head room and to interfere as little as possible with free use of spaces through which they pass. They shall be installed as close to building structure as possible such that, where concealed, necessary furring can be kept to a minimum. Arrange conduits, installed in suspended ceilings, to provide minimum interference with removal of tiles.

3.2 **SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5m (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.

3.3 **CONCEALED CONDUIT**

- .1 Do not install horizontal runs in masonry walls.
- .2 Do not install conduits in terrazzo or concrete toppings.

END OF SECTION

OUTLET BOXES, CONDUIT BOXES AND FITTINGS
26 05 35

PART - 1 GENERAL

1.1 RELATED WORK

- .1 Box connectors to Section 26 27 28.

1.2 REFERENCES

- .1 CSA C22.2 No. 18.
- .2 CSA C22.1 Canadian Electrical Code, Part 1, Ontario Hydro Electrical Safety Code.

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

2.2 SHEET STEEL OUTLET BOXES

- .1 Hot dipped galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 mm x 50 mm x 38 mm (3" x 2" x 1½") or as indicated. 102 mm (4") square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 102 mm (4") square or octagonal outlet boxes for lighting fixture outlets.
- .3 102 mm (4") square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 MASONRY BOXES

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

2.4 CONCRETE BOXES

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

2.5 FLOOR BOXES

- .1 Concrete tight hot dipped galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass or brushed aluminum faceplate. Device mounting plate to

accommodate short or long ear duplex single or receptacles. Minimum depth: 28 mm (1¹/₄") for receptacles; 73 mm (3") for communication equipment.

- .2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 12 mm (1/2") and 19 mm (3/4") conduit. Minimum size: 73 mm (3") deep.

2.6 CONDUIT BOXES

- .1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle, outside building and where weatherproof boxes are required.
- .2 Explosion proof boxes in areas indicated on drawings.

2.7 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 (1¹/₂") 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 Provide a suitable outlet box for each light, switch, receptacle or other outlet, approved for the particular area in which it is to be installed.
- .6 Locate outlet boxes, mounted in hung ceiling space, so they do not obstruct or interfere with the removal of lay-in ceiling tiles.
- .7 Offset outlet boxes, shown back to back in partitions, horizontally to minimize noise transmission between adjacent rooms.
- .8 Use gang boxes at locations where more than one device is to be mounted. Use combination boxes with suitable barriers where outlets for more than one system are shown.

Where 100 mm (4") square boxes are installed in exposed concrete or cinder block in finished areas, blocks will be cut under masonry division as instructed under this section. Openings shall be cut to provide a close fit to boxes and covers so that edges of openings are not visible after installation of plates. Mortar shall not be used to patch up openings that are cut too large or to patch ragged edges.

END OF SECTION

WIREWAYS AND AUXILIARY GUTTERS
26 05 37

PART - 1 GENERAL

1.1 PRODUCT DATA

- .1 Submit product data in accordance with Section 26 05 01 Electrical General Requirements.

PART - 2 PRODUCTS

2.1 WIREWAYS (LAY-IN CABLE DUCT)

- .1 Fabricated from code gauge sheet steel and complete with hinged covers and standard knockouts on 300 mm (12") centres, unless noted otherwise. Inside and outside shall be treated with a rust inhibiting etching process.
- .2 **Finish: Inside and outside shall be treated with a rust inhibiting process and outside shall be finished in Sherwin Williams Paint, #F65Y4 (Yellow).**
- .3 Elbows, tees, couplings and hanger fittings manufactured as accessories to wireway supplied.
- .4 Cross-section dimensions as indicated.

Standard of Acceptance

- W. C. Pursley Ltd.
- Square D Company Canada Ltd.
- G. A. Harding Ltd.
- Pilgrim technical Products Ltd.

PART - 3 EXECUTION

3.1 INSTALLATION

- .1 Install wireways and auxiliary gutters.
- .2 Keep number of elbows, offsets, connections to minimum.
- .3 Install supports, elbows, tees, connectors, fittings.
- .4 Install barriers where required.
- .5 Install gutter to full length of equipment.

END OF SECTION

WIRING TO MOTORIZED DOORS
26 07 16

PART - 1 GENERAL

1.1 RELATED WORK

- .1 Door control panel will be provided with door. Interconnecting power and control wiring and on-off switch will be provided by Division 26.

PART - 2 PRODUCTS

2.1 DISCONNECT

- .1 On-off switch shall be rated 15A, 120 volt.

PART - 3 EXECUTION

3.1 INSTALLATION

- .1 Provide conduit, wiring and on-off switch for each motorized door. Mount door control panel. Install interconnecting power and control wiring to motor, controller, sensors and limit switches.
- .2 On-off switch shall be mounted in ceiling space above door.
- .3 Wire to fire alarm system to de-energize doors when fire alarm system is activated.

END OF SECTION

ELECTRICAL COMMISSIONING

26 08 15

GENERAL

SCOPE

The Hospital will retain an Independent Commissioning Agent (CA) who will provide actual Commissioning Services including witness Testing and Commissioning Services as required.

PART - 1

1.1

.1

Include all labor and material as required to participate in the commissioning process, as outlined in this section, for equipment installed under Division 26.

WORK INCLUDED

.2

Commissioning work of Division 26 includes, but is not limited to:

1.2

.1

.1

Participation in regular construction meetings as well as separate Commissioning Meetings during the construction period associated with the scheduling, coordination, and implementation of the various commissioning activities within the overall construction program.

.2

Site Testing and start-up of equipment.

.3

Detailed acceptance testing as described under various equipment specifications including supplementary testing required by Commissioning Authority

.4

Cooperation with the Commissioning Authority in developing and implementation of the commissioning plan.

.5

Providing qualified personnel for participation in implementing commissioning test procedures.

.6

.7

Providing equipment, materials, and labor as necessary to correct construction and/or equipment deficiencies found during the commissioning process.

.8

Providing operation and maintenance manuals, and as-built drawings to the Commissioning Authority for verification in a timely manner.

.2

Providing training and demonstrations for the systems specified in this Division prior to turnover to Owner.

.1

Conduct complete and thorough evaluation and documentation of the operation and performance of all components, systems, and sub-systems, including the following equipment and systems:

.2

Fire Alarm System Verification

.3

Nurse Call System Verification

.4

Security System Verification

Emergency Battery Lighting System Verification

Note:

All of the above Electrical Systems are to be tested/ verified by this Contractor. Commissioning Scope is to ensure the work is completed and acceptable. Requires some active witnessing of some testing.

PRODUCTS (NOT USED)

EXECUTION

COMMISSIONING MEETINGS

PART - 2

Participate in periodic commissioning team meetings, and trade commissioning meetings.

PART - 3

3.1

Construction and Post-Construction:

- .1 participate in commissioning meetings as scheduled by the General Contractor.
- .2 participate in trade commissioning meetings as required, in addition to the regular commissioning team meetings,
 - .1
 - .2 identify to the commissioning group problems relating to the commissioning schedule, identification of start-up issues, etc, and participate in the resolution of these problems.
 - .3

COMMISSIONING PROCEDURES

3.2

- .1 The Owner's designated Commissioning Authority provides the commissioning procedures (checklists, etc) for use by the contractor.
- .2 Each commissioning procedure tests the equipment and systems, and consists of the following elements:
 - .1
 - .2 Document sign-off
 - .3 Pre-start and Initial test
 - .4 Installation Verification - Equipment
 - .5 Installation Verification - Systems
- .3
 - .1 Performance Validation

Document Sign-Off:

each completed procedure is signed off by the following parties:

- .4
 - (a) Contractor, for testing,
 - .1 (b) Commissioning Consultant, for review and witnessing,
 - (c) Owner, for test acceptance.
- .2

Installation Verification - Equipment

Checklists to verify the installation of equipment, including: design specification requirements, drawing requirements, manufacturer installation requirements, and other experience-related items.

Use of pre-printed manufacturer installation and start-up checklists are permitted and encouraged; however, the commissioning procedure checklists may contain supplemental items.

Installation Verification - System: Checklists to verify the installation of the system associated with the equipment.

Performance Validation: Specific test procedures and record documentation requirements for performance measurements of the various systems.

COMMISSIONING TEST METHODOLOGY

- .5
 - .6
 - 3.3
 - .1
 - .2
 - .3
 - .4
- Step 1 : Notify the Commissioning Consultant in accordance with an agreed schedule and notification period when testing will begin on each procedure type. The Commissioning Consultant will witness the testing on an audit basis, including the first instance, the last instance, and at random during other times.
- Step 2 : complete the commissioning procedures including recording results, and sign-off and date separately the completion of Part “A” Verification, and Part “B” Validation. Any deficiencies discovered during this testing are to be corrected prior to sign-off of the test.
- Step 3 : on completion of systems which do not require witness demonstration, finalize the report and submit to the Commissioning Consultant and the Consultant for review.
- Step 4 : on completion of systems which have been witnessed by the Commissioning Consultant, the Commissioning Consultant is to sign-off the completed procedure document as being witnessed.

COMMISSIONING IMPLEMENTATION

- 3.4
 - .1
 - .2
 - .3
- Conduct operating tests and checks to verify that all components, equipment, systems, and interfaces between systems, operate in accordance with contract documents.
- Demonstrate and verify operating modes, interlocks, specified control sequences, specific responses to abnormal or emergency conditions, and verification of the proper response to the Building Automation System, security system, and fire alarm system as applicable.

Roles and Responsibilities:

Organized by:	General Contractor
Test sheets provided by:	Commissioning Authority
Testing Conducted by:	Division 26 Contractors Equipment Suppliers Technical Personnel as appropriate Independent Testing Agent as specified
Testing recorded by:	Division 26 Contractors Equipment Suppliers Technical Personnel as appropriate Independent Testing Agent as specified Commissioning Authority
Tests witnessed by:	Commissioning Consultant Owner (selected tests)
Reports reviewed by:	General Contractor Commissioning Consultant Design Consultant Owner / Commissioning Authority
Reports Accepted by:	Owner

OPERATING CHECKS

The Commissioning Consultant witnesses selected equipment and system tests on an audit basis.

Set the system equipment into operating mode to be tested including but not limited to:

- 3.5
 - .1 Normal start up, operation, and shut-down
 - .2 Normal auto position
 - .2 Normal manual position
 - .1 Unoccupied cycle
 - .2 Emergency power operation, including transition states.
 - .3 Status and Alarm conditions
 - .4
 - .5 Inspect and verify the position of each device and interlock identified on the checklist.
 - .6 Repeat the above tests for each operating mode that applies to the system being tested.
 - .3
 - .4 For failed test items, provide appropriate comments to the checklist data sheet and classify whether it is a "Major" or "Minor" deficiency.
 - .5
 - .1 The Consultant retains the right to make the final decision regarding classifications of deficiencies.
 - .6 Test failure is defined as:
 - .1 Refer to relevant specification sections.
 - .7 Acceptance
 - .1 The final reports will be reviewed by the Commissioning Consultant and the Consultant, to determine if verification is complete and the operating systems are functioning in accordance with the contract documents.
 - .2
 - .3 The Commissioning Consultant, in conjunction with the Consultant, reviews and makes final classification of all noted deficiencies. Correct deficiencies classified as "Major" before acceptance of the Verification stage.
- 3.6
 - .1 The Owner will make the final acceptance of test results.

PERFORMANCE VALIDATION TESTING

- .2
 - .1 Conduct performance tests and checks to validate that equipment and system components are providing the required performance (capacity) for each equipment and system.
 - .2
- Special testing requirements:
 - 3.7
 - .1 Conduct acoustic measurement tests outside the building when generators are running, in accordance with local noise by-law procedures.
 - Conduct acoustic measurement tests inside of generator room when generators are running.

PROBLEM RESOLUTION

In the event that additional work is required to either correct systems, misapplied or improperly installed equipment, and/or deficient performance under varying load conditions, assist the Owner and Commissioning Consultant in developing an acceptable resolution to the problem, including the resources of equipment suppliers.

The Owner has final approval over any additional work required to achieve the required level of performance.

Complete corrective work in a timely fashion to permit the completion of the commissioning process.

ACCEPTANCE

.2

Any identified deficiencies will be reviewed by the Consultant in conjunction with the General Contractor/Construction Manager to determine if correction of the deficiency is as a result of a defect in the equipment or installation.

.3

3.8

.1

If it is determined the performance deficiency is as a result of a defect in the equipment or its installation, rectify the deficiency and repeat the performance test until the required performance levels are achieved.

.2

If it is determined the equipment or system has been constructed in accordance with the contract documents, the Owner will decide whether to accept the performance as is, or, direct the installation contractor to make changes to the system as required to obtain performance levels which meet the design intent, and retest the system.

.3

POST-SUBSTANTIAL PERFORMANCE COMMISSIONING

3.9

Provide commissioning after Substantial Performance:

.1

Performance testing which is weather or live-load dependent;

.1

.2

For out-of-season system performance testing, conduct initial performance tests to demonstrate off-peak load performance. Schedule peak load performance testing over the succeeding nine (9) months to ensure all equipment is tested at peak load prior to the expiry of the warranty period.

.3

.4

Infra-red thermal imaging of equipment under peak building live-load conditions,

.5

90 day security system testing,

Alternatively, provide temporary equipment (load banks, etc) to simulate full load conditions. Submit proposed methodology for review by the Commissioning Authority and Consultant.

3.10

.1

ADDITIONAL COMMISSIONING

3.11

.1

Additional commissioning activities may be required after completion of system performance testing. Include in the tender cost a reasonable reserve to complete this work, including assistance from manufacturers' service technicians.

.2

SYSTEMS OPERATING MANUALS

.1

Provide Operating and Maintenance Manuals in accordance with the requirements of section 16010.

The Systems Operating Manuals (SOM) are in addition to the Operating and Maintenance Manuals (OMM) required under Section 16010.

Provided by Commissioning Authority and/or Consultant.

TRAINING

Equipment Training:

Provide equipment training in accordance with Section 26 05 01 and the relevant equipment specification sections. The manufacturer's representative training will emphasize operating instructions and preventative maintenance.[]

3.12

Systems Training:

.1

.1

In addition to the equipment training described above, provide additional training to describe the operational requirements and design intent of each system.

.2

Include classroom instruction, delivered by competent instructors. Place emphasis on overall systems diagrams and descriptions, and design criteria and conditions.

.1

If required, obtain and pay for the services of the Design Consultant to provide the instructor services and to provide lecture material for inclusion in the training manual.

.2

.3

Training topics to include:

.4

- (a) Types of installed systems
- (b) Design intent and design criteria
- (c) Design constraints
- (d) Different operating modes – occupied, unoccupied, emergency conditions, etc.
- (e) Seasonal operating modes
- (f) Energy efficiency
- (g) System operation
- (h) Automatic controls
- (i) Service, maintenance, diagnostics and repairs
- (j) Use of reports and logs
- (k) Troubleshooting

.5

.6

Structure each session to start with the classroom instruction for the overall system, followed by hands-on instruction for each equipment, with the services of the manufacturers' representative as required. Demonstrate the start-up and shut-down of each system.

.7

Organize and schedule each training session to deliver the required instruction in an efficient and effective manner on a schedule agreed upon with the Owner. Allow for two (2) training sessions for each topic, separated by approximately one week each, to allow for shift coverage.

.8

Structure each training session based on type of maintenance personnel attending the training session, ie. Plumbers, fitters, general maintenance, controls technicians, etc. Develop the proposed training plan and obtain approval from the Owner before commencing the training.

Complete the training as close to Substantial Performance as possible, so that the Owner's operations staff are prepared to operate the system after Substantial Performance is certified.

Training Manuals

Provide training material hand-outs for each session.

Collect training material and bind into separate binders.

END OF SECTION

.3

.1

.2

PROJECT CLOSE-OUT ELECTRICAL
26 08 19

PART - 1 GENERAL

1.1 SCOPE

- .1 Provide documentation deliverables at completion of the Work.

1.2 SUBSTANTIAL PERFORMANCE

- .1 Complete the Substantial Performance Checklist and submit with required documentation when applying for Substantial Performance of the Work.
- .2 Where the work is sub-divided into separate scopes of Work, each requiring a separate Substantial Performance application, provide a separate checklist for each application.
- .3 Prepare and submit to the Consultant a comprehensive deficiency list of items to be completed or corrected, as part of the application for a review by the Consultant to establish Substantial Performance of the Work, or for each designated portion of the Work in the case of phased Substantial Performance.
 - .1 Failure to include an item on the list does not alter the Contractor's responsibility to complete the Work.
- .4 Within five working days of the Consultant's review report which indicates that Substantial Performance of the Work has been achieved, provide a detailed schedule for completion and/or correction of the Work of all items described in the Contractors' and the Consultants' deficiency list.

1.3 TOTAL PERFORMANCE

- .1 Submit the following documentation with the application for Total Performance. Application for Total Performance cannot be submitted any earlier than the date of Alternate Season testing.
 - .1 Where documentation has already been submitted to the Owner, provide a copy of the transmittal.

SUBSTANTIAL PERFORMANCE APPLICATION CHECKLIST	
Project Name:	
Contract:	
Contract Scope:	
Application Date:	
Signed:	

The following requirements are completed and included in this application. Where documentation has been issued directly to the Owner, a copy of the transmittal is enclosed.

- Contractor has compiled and submitted a detailed deficiency list, identifying work still to be completed, incomplete, or requires correction.
- Equipment start-up reports (Interim).
- Building department inspection reports.
- ESA field inspection reports.
- Fire alarm verification certificate.
- Independent testing company, coordination study and testing reports submitted.
- Equipment and wiring identification completed
- Clean-up completed.
- Spare parts and replacement parts turned over to Owner; transmittal attached.
- Warranty certificates
- Operating and Maintenance Manuals, draft, submitted.
- As-built drawings submitted
- Training completed and attendance logs submitted.
- Commissioning reports submitted and reviewed by Consultant

Consultant Review	
Status:	<input type="checkbox"/> Reviewed <input type="checkbox"/> <u>Incomplete or deficient - resubmit</u>
Signed:	
Date:	

TOTAL PERFORMANCE APPLICATION CHECKLIST	
Project Name:	
Contract:	
Contract Scope:	
Application Date:	
Signed:	

The following requirements are completed and included in this application. Where documentation has been issued directly to the Owner, a copy of the transmittal is enclosed.

- All known deficiencies have been corrected, including latent deficiencies reported by the Owner.
- Final commissioning reports submitted and accepted by Owner.
- Operating and Maintenance manuals - finalized and submitted (if final version was issued at time of Substantial Performance indicated here:
- As-built drawings final version submitted (if final version was issued at time of Substantial Performance indicate here: Date of delivery: _____

Consultant Review	
Status:	<input type="checkbox"/> Reviewed <input type="checkbox"/> Incomplete or deficient - resubmit
Signed:	
Date:	

END OF SECTION

HEADWALL UNITS

26 26 26

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.
- .2 Conform to Section 26 05 01, Electrical General Requirements.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 26 05 01 Electrical General Requirements.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.
- .3 Nameplates shall be in accordance with Article "Equipment Identification".

1.3 WORK INCLUDED

- .1 Work to be done under this Section shall include furnishing of materials and equipment required for the units as shown, as specified and as otherwise required.
- .2 **A quantity of eight (8) Service Consoles Type 'A' (Wall mounted horizontal Headwall Units) are required**

1.4 GENERAL

- .1 Service consoles, as shown on the drawings, shall provide grouped services at typical single bed locations, extending wall to wall at +/- 48" above the floor. They shall be wiring suitable for electrical feeds to built-in and remote receptacles, pre-wired electrical and pre-piped medical gas outlets and space for nurse call system as specified elsewhere, cardiac arrest call system, monitor system etc., all as specified elsewhere.
- .2 Colour of front panel will be selected at a later date. A standard range of colour chips shall be submitted.
- .3 Gas piping shall be designed for connection, at top of unit, by Mechanical Division 15.
- .4 Medical gas piping shall conform to latest edition of CSA Standard Z305.1.
- .5 Overall unit shall have CSA approval or carry Special Hydro Approval label.

PART - 2 PRODUCTS

- .1 Service consoles shall be complete with structural frame, service panels, service chases, covers and other equipment as required.
- .2 Service consoles shall include wiring for electrical feeds from remote power services as detailed.
- .3 Consoles shall have a primed and painted cold rolled steel base of unit construction. Base shall be complete with barriers and support members as required.
- .4 Consoles shall be supplied as a complete unit with removable front panels. Consoles shall have all devices, except where noted, pre-wired and pre-piped to the top of the unit. Wiring shall be terminated on junction boxes or terminal strips. Medical gas piping shall

- extend 6" above the top of the unit and shall be fitted with plastic caps to prevent dirt from entering piping.
- .5 Front panels shall be formed in one piece to fit the base channel and shall have openings to receive electrical and medical gas outlets as required. Front panels shall be sectionalized to allow access to services.
 - .6 Unit shall be complete with mounting holes for fastening to wall structure at top and bottom of unit.
 - .7 Channels or barriers shall be provided to separate power and communication systems wiring.
 - .8 Cover plates shall be Type #302 stainless steel with a #4 finish.
 - .9 Electrical components shall be as follows:
 - .1 Receptacles shall be "Decora Style, "Hospital Grade type, brown for normal power and red for emergency power.
 - .2 Switches shall be Lutron Type (LED compatible and white coloured)
 - .3 Outlet for Rauland 'Responder 5' Nurse Call (Nurse Call components and wiring are provided by Electrical Contractor on site)
 - .4 Outlets for Telephone, Data & Monitor Jacks (Network components and wiring are provided by Electrical Contractor on site)
 - .10 Components shall be mounted in suitable backboxes and shall have a common cover plate for services shown horizontally
 - .11 Receptacles and other equipment shall be connected to two pole breakers in the associated Electrical Panel with 1000 volt, 90°C. X-link copper wiring. Substitute insulation will not be permitted.
 - .12 Medical gas piping shall be hard temper Type "L" with wrought copper fittings. Joints shall be brazed with a silver solely conforming to the American Welding Society Specification BCUP5. Flux shall not be used. During brazing operation the pipe shall be filled with nitrogen to eliminate inside piping scaling.
 - .13 The tail pipe of the medical gas outlets shall be increased immediately from ¼" as follows:
 - .1 to ½" for oxygen and medical air
 - .2 to ¾" for medical vacuum
 - .14 Upon completion of piping the piping shall be pressure tested to 150 psi and checked for leaks for means of an oxygen compatible commercial leak detector.
 - .15 Medical gas outlets shall be DISS type as follows:

Gas	Almed	Puritan-Bennett	Medigas
Oxygen	9603-1250-5	125100	1124
Vacuum	9603-1255-5	125103	1122
Air	9603-1265-2	125102	1116

- .16 Outlets shall be provided on the front of the unit for each of the following services: nurse call, code blue, telephone, monitor, etc.. For each of the foregoing a separate junction box shall be provided.

- .17 Standard equipment to be supplied shall be as follows (confirm exact requirements and quantities on site):
 - .1 adjustable accessory track system
 - .2 junction box and conduit for monitor output to central monitor station
 - .3 track and monitor shelf, adjustable with slide bracket
 - .4 Sphygmo mount with cuff basket (provide 1 per unit)
 - .5 pivoting arm bracket (provide 2 per unit)
 - .6 infusion pump support mount (provide 2 per unit)
 - .7 utility mount, slide type (provide 2 per unit)
 - .8 universal holders (provide 2 per unit)
 - .9 pivoting storage basket, with liner (provide 1 per unit)
 - .10 waste basket, with liner (provide 1 per unit)
 - .11 small storage basket (provide 1 per unit)
 - .12 adjustable shelf with bumper (provide 1 per unit)
 - .13 Vacuum bottle slides conveniently located to accept bottle bracket (provide 2 per unit)
- .18 For overall arrangements of the Headwall Units, refer to drawing details.
- .19 **Acceptable manufacturers/ suppliers are:**
 - Class 1 Inc. contact Tricia Blondin**
 - Director, Sales & Project Management
 - T: (519) 650 2355 x235 | C: (519) 501 9260 | tricia.blondin@class1inc.com

PART - 3 EXECUTION

- .1 Provide service consoles as shown and as specified. Provide accessories as scheduled.
- .2 Verify final overall height prior to ordering.
- .3 Connect each isolated power centre to the incoming power supply, including 1 #8 insulated green ground conductors to be run with the circuit conductors and connected to the ground bar of the breaker panel in the console.
- .4 Secure units to walls in accordance with the recommendations of the manufacturer.
- .5 Co-ordinate the nurse call space requirements with the equipment supplier.

END OF SECTION

LIGHTING & RECEPTACLE PANELS
26 27 16

PART - 1 GENERAL

1.1 REFERENCES

- .1 CSA C22.2 No. 29-M1989.

1.2 RELATED WORK

- .1 Plywood Backboard: Section 06 10 00 - Rough Carpentry

1.3 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.
- .2 Conform to Section 26 05 01, Electrical General Requirements.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 26 05 01 Electrical General Requirements.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.
- .3 Nameplates shall be in accordance with Article "Equipment Identification".

1.5 WORK INCLUDED

- .1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete systems as shown as specified and as otherwise required.

1.6 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 26 05 01 Electrical General Requirements.

1.7 MAINTENANCE MATERIALS

- .1 Provide maintenance materials as required and as specified in Section 26 05 01 Electrical General Requirements.

1.8 OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Provide operating and maintenance instructions as specified in Section 26 05 01 Electrical General Requirements.

1.9 PLANT ASSEMBLY

- .1 Install circuit breakers in panelboards before shipment.
- .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

1.10 **IDENTIFICATION**

- .1 Panels shall be identified with lamacoid plate with shall include panel designation 12 mm (½") lettering, voltage and phase 5 mm (¼") lettering and where panel is fed from 5 mm (¼") lettering.

PART - 2 PRODUCTS

2.1 **PANELBOARDS**

- .1 Product of one manufacturer. **Overall Cover shall be hinged to permit access to breakers and wiring compartment.**
- .2 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. When numbering breakers, number from top to bottom and from left to right.
- .3 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .4 Two keys for each panelboard and key panelboards alike.
- .5 Copper bus with neutral of same ampere rating as mains.
- .6 Panels shall be constructed and finished in accordance with details specified in Section 26 27 18 "Panel Trim".
- .7 Panels shall be surface or flush mounted type, as shown.
- .8 Panels shall be dead front type in code gauge steel enclosure.
- .9 Each panel shall be complete with a typewritten directory which shall be mounted inside door with clear plastic cover.
- .10 Panels shall have mains of voltage and capacity, and main and branch breakers and contactors, as shown on the "Lighting and Receptacle Panel Schedule". Spaces shall include the necessary bus work such that Owners, at a later date, need buy only the breakers.
- .11 Where panels exceed 42 circuits, use multi-section panel with main cross-over solid bus bars. Main bus capacity of each section shall be full size to match cross-over bus. Cross-over bus shall be concealed by panel trim. Separate covers are not acceptable.
- .12 Breakers shall have bolted type connections.
- .13 **Panels shall include non-automatic Main Breaker and a bus-mounted, 120/ 208 volt, 3 phase, 4 wire, 200,000 ampere maximum surge capacity built-in transient surge suppression device.**
- .14 Panels for 120/208 volts, three phase, four wire systems shall be complete with full size breakers, having a symmetrical interrupting rating of at least 10,000 A.
- .15 Where indicated breakers shall have a ground fault interrupter.

Standard of Acceptance

- **PANELS MUST MATCH EXISTING HOSPITAL STANDARDS AND BE AS MANUFACTURED BY SQUARE D**

2.2 BREAKERS GENERAL

- .1 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation.
- .2 Common-trip breakers: with single handle for multi-pole applications.
- .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 5 - 10 times current rating.
- .4 Circuit breakers with interchangeable trips over 150 A.
- .5 Lock-on devices for clock outlet, fire alarm, security systems, battery chargers, door supervisory, intercom, stairway, exit and night light circuits.

2.3 THERMAL MAGNETIC BREAKERS

- .1 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.

2.4 TRIM

- .1 Front panel trim shall be overall hinged type, door within door construction. Trim assembly shall provide hinged access to the internal tub and wiring channels for access to wiring and breaker terminals without removal of the trim assembly. With overall trim assembly closed and secured, a second integral hinged door forming part of the trim assembly shall provide access to the circuit breakers only for opening and closing purposes
- .2 Panels shall be given a rust-resistant treatment to both tub and trim. Locks shall be chrome plated.
- .3 Flush panels shall have concealed hinges and flush type combination lock latch. Doors shall open minimum 135 degrees. Trims shall have fasteners concealed and shall be prime coated to receive room finish paint.
- .4 Surface mounted panels shall be constructed in accordance with CSA Type 2 enclosures with overall door assembly protecting all circuit breakers. Door(s) shall be gasketed, with overhanging drip shield, with T-handle 2 point locking system complete with lock and latch.
- .5 **Panels shall be finished with two coats of paint in accordance with the following Sherwin Williams colour code:**
 - .1 **Normal Power: #F65L7, Pale Blue**
 - .2 **Emergency Power: #F65E37 International Orange**
- .6 Panel locks shall be common to one key throughout project.

2.5 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Electrical General Requirements.
- .2 Nameplate for each panelboard size 4 engraved, Submit nameplate wording.
- .3 Complete circuit directory with typewritten legend showing location and load of each circuit. Cover directory with a 0.8 mm (1/32") thick clear plastic sheet.

- .4 Nameplates for electrical panels shall indicate panel designation and mains voltage, i.e. 120/208 V, 3 ϕ , 4 W and panel and circuit number from which this panel is fed

PART - 3 EXECUTION

3.1 INSTALLATION

- .1 Locate panel boards 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 Section 26 05 01 - Electrical General Requirements, or with top of trim at uniform height of 2000 mm (6' -6") or to match door heads or to suit tile layout, or as indicated.
- .4 Co-ordinate panel finish with Room Finish Schedule.
- .5 Deliver ten (10) duplicate keys for panel locks to Owner.
- .6 Connect loads to circuits.
- .7 Connect neutral conductors to common neutral bus with respective neutral identified.
- .8 Provide minimum #6 AWG green insulated copper bonding conductor in conduit to interconnect normal and emergency power panels serving common patient care areas.

END OF SECTION

MULTI OUTLET ASSEMBLIES

26 27 19

PART - 1 GENERAL

1.1 PRODUCT DATA

- .1 Submit product data in accordance with Section 26 05 01.
- .2 Indicate type of multi-outlet assemblies with similar terminology to these documents.
- .3 Product is generally referred to as "Wiremold"

PART - 2 PRODUCTS

2.1 SURFACE RACEWAY FOR WIRING DEVICES

- .1 Two piece assembly manufactured for mounting wiring devices and associated wiring.
- .2 Cross-section dimensions: as indicated.
- .3 Finish: buff enamel.

Standard of Acceptance

- Wiremold
- Canadian Electric Raceways

2.2 WIRING DEVICES

- .1 Wiring devices: as indicated, to Section 26 27 26 - Wiring Devices including specified stainless steel cover plates.

2.3 GROUNDING

- .1 Ground system through raceway separate insulated conductor.

2.4 FITTINGS

- .1 Elbows, tees, couplings and hanger fittings manufactured as accessories to product line supplied.

PART - 3 EXECUTION

3.1 FITTINGS

- .1 Install supports, elbows, tees, connectors, fittings.
- .2 Keep number of elbows, offsets and connections to minimum.
- .3 Install barriers where required.

3.2 WIRING

- .1 Install wiring as indicated.

- .2 Where Normal and Emergency Power wiring are required to “share” the power section, Contractor is to utilize BX Cable to provide the required separation between sources. Cover is to include suitable labeling noting two sources.

END OF SECTION

WIRING DEVICES 26 27 26

GENERAL

REFERENCES

CSA C22.2 No. 111-M1986 Switches.

PART - 1 CSA C22.2 No. 42-M1984 Receptacles.

1.1 Section 26 28 19 - Ground Fault Circuit Interrupters.

.1
.2
SHOP DRAWINGS AND PRODUCT DATA

.3 Submit shop drawings and product data in accordance with 26 05 01 Electrical General Requirements.

1.2

.1
IDENTIFICATION

1.3 Receptacles shall have a circuit identification lamacoid in accordance with CSA Z32 - 09.

.1 Lamacoid shall be secured to the wall above the receptacle and shall be engraved with panel name and circuit number from which the receptacle is fed. Lettering shall be minimum 6 mm (¼") high and as follows:

.1

(a) normal power: black lettering on white lamacoid.

(b) emergency power: red lettering on a white lamacoid.

.2

Provide additional lamacoid for dedicated circuit receptacles, of matching colour, indicating the words: "Dedicated Circuit"

1.4

.1
PRE/ POST OCCUPANCY PROVISIONS

Assuming the Hospital will, as the time for occupancy approaches or even after occupying, resolve that some additional receptacles/ power outlets will be required. Include, in the Contract, the following additional installations:

- a) **five (5) Emergency Power 15 amp, 120 volt Duplex Receptacles**
b) **five (5) Normal Power 15 amp, 120 volt Duplex Receptacles**
c) **five (5) 15 amp, 120 volt direct connection outlets**
.2 d) **two (2) 15 amp, 208 volt direct connection outlets**
e) **one (1) 120-24 volt Power Supplies for "Paper Towel Dispensers"**
f) **two (2) LED compatible Dimmers**

Each component with an average of 50'-0" of wire in conduit installed and terminated at the nearest Electrical Panel will be required. Include outlet box, wire, conduits, face-plates, labels, terminations, testing, and documentation for each. Assume, for bidding purposes, that these can be added at any time during construction including at the end of the construction and in any location as directed on site. Devices not installed at the construction completion are to be turned over to the Hospital as spare parts for future installation.

PRODUCTS

SWITCHES

20 A, 120 V, silent, AC type, CSA listed, single pole, double pole, three-way, four-way switches “decorative type”.

PART - 2

Manually-operated general purpose ac switches with following features:

2.1

Terminal holes approved for No. 10 AWG wire.

.1

Silver alloy contacts.

.2

Urea or melamine moulding for parts subject to carbon tracking.

.1

Suitable for back and side wiring.

.2

White coloured “rocker” toggle.

.3

.4

.5

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

.3

Switches of one manufacturer throughout project.

.4

Catalogue numbers listed below have been used for convenience only to indicate quality standards:

.5

TYPE	APPROVED CATALOGUE NUMBERS
	HUBBELL(120 VOLT)
SINGLE POLE	HBL2121WA
DOUBLE POLE	HBL2122WA
THREE-WAY	HBL2123WA
FOUR-WAY	HBL2124WA

.6

.7

Combination switches shall have neon pilot light and jewel on stainless steel plate

Switches controlling lights on 120 volt emergency circuits shall be with lighted handle as follows:

TYPE	APPROVED CATALOGUE NUMBERS
	HUBBELL(120 VOLT)
SINGLE POLE	HBL2121ILWA
THREE-WAY	HBL2123ILWA

Standard of Acceptance

- Pass & Seymour
- Harvey Hubbell of Canada Ltd.
- Bryant Electric
- Cooper Wiring Devices
- Leviton

DIMMER SWITCHES

Dimmers for use on LED Luminaires shall be equal to Lutron, "Nova Series", LED compatible as noted and white cover plates.

2.2 Matching switches shall be used adjacent to dimmers.

.1 Where more than one dimmer is shown in the same location, mount dimmers in individual backboxes. Provide matching switches where shown adjacent to dimmers.

.2

.3 **RECEPTACLES**

2.3 Receptacles shall be decorator style to be complete with following features:

- .1 urea moulded housing.
 - .1 Suitable for no. 10 AWG for back and side wiring
 - .2 Break-off links for use as split receptacles.
 - .3 Eight back wired entrances, four side wiring screws.
 - .4 Triple wipe contacts and rivetted grounding contacts.
 - .5
 - .6 receptacles to be Heavy duty Hospital grade type

.2 Receptacles of one manufacturer throughout project.

.3 Receptacles shall be colour coded as follows:

- .1 Normal power: white
- .2 Emergency power: red

.4

Receptacles shall be as shown and as specified. For convenience, only one or two catalogue numbers of manufacturers have been shown.

Standard of Acceptance

- Pass & Seymour
- Harvey Hubbell of Canada Ltd.
- .1 ◦ Bryant Electric
- Cooper Wiring Devices
- .2 ◦ Leviton

The receptacles listed below represent the most common configurations available and are not necessarily used on this project. Refer to drawings for types used.

Duplex receptacle: 15 ampere, 120 volt, grounded CSA Configuration 5-15R:

Standard of Acceptance

TYPE	APPROVED CATALOGUE NUMBERS				
	P & S	HUBBELL	BRYANT	LEVITON	COOPER
STANDARD (NON-DECORA) (HOSPITAL GRADE)	5262 8200	5262 8200	5262 8200	5262 8200	5262 8200
DECORA (HOSPITAL GRADE)	26252 26262HG	2152 2172	9252 9200	5280 16262- HG	6262 8262

.3 Weatherproof, 15 ampere, 120 volt equal to those above but complete with gasketted cast plate and hinged covers, equal to Leviton No. 4926 (vertical).

.4 Twistlock receptacle: 15 ampere, 120 volt, grounded CSA Configuration L5-15R

Standard of Acceptance

- Single: Hubbell/P&S/Bryant/Leviton/Cooper 4710
- Duplex: Hubbell/P&S/Bryant/Leviton/Cooper 4700

.5 Duplex receptacle: 15 / 20 ampere, 120 volt, grounded CSA Configuration 5-20R:

Standard of Acceptance

TYPE	APPROVED CATALOGUE NUMBERS				
	P & S	HUBBELL	BRYANT	LEVITON	COOPER
STANDARD (NON-DECORA) (HOSPITAL GRADE)	5362 8300	5362 8300	5352 8300	5362 8300	5362 8300
DECORA (HOSPITAL GRADE)	26352 26362HG	2162 2182	9352 9300	- 16362- HG	6362 8362

2.4

.1

FLOOR OUTLETS

Duplex floor receptacles in flush mounted floor box, 15 ampere, 120 volts shall be complete with adjustable, watertight floor boxes, CSA Configuration 5-15R.

Standard of Acceptance

- Hubbell B2431 single gang box (brass)
- Hubbell B2432 double gang box (brass)
- Hubbell B2433 three gang box (brass)

Service fitting for floor receptacle shall be complete with receptacle specified above, unless noted otherwise.

Standard of Acceptance

- .2
- Hubbell S3625, duplex screw cover (brass)
 - Hubbell S3825, duplex flap (brass)

COVER PLATES

2.5

Switch, receptacle and other plates shall be smooth white nylon decorative style in finished areas and pressed steel in unfinished areas. Cover plates shall be Hubbell "Style Line" or equal as manufactured by:

.1

- Arrow-Hart of Canada Ltd.
- Pass & Seymour Inc.
- Smith & Stone Ltd.
- Leviton
- Westinghouse Canada Ltd.

.2

Cover Plates shall be finished as follows:

.1

Light Switches: White

.2

Receptacles, Normal power: gray

.3

Receptacles, Emergency power: red

.3

.1

Cover plates for wiring devices. Cover plates from one manufacturer throughout project.

.2

Stainless steel 18-8 chrome metal alloy, Type 302, vertically brushed, 1 mm (1/32") thick cover plates for wiring devices mounted in flush-mounted outlet box.

.3

.4

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

.5

Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

Letters shall be 6 mm (1/4") high filled with red paint where engraving is indicated. Engraving shall be parallel to finished floor level.

Standard of Acceptance

- Pass & Seymour #93000 Series
- Harvey Hubbell of Canada Ltd. #93000 Series

- Bryant Electric #S600 Series
- Leviton #84000 Series
- Cooper #93000 Series

GROUND FAULT CIRCUIT INTERRUPTERS

Units shall be CSA approved Type A.

2.6 Ground fault circuit interrupters (GFCI) shall be complete with receptacle, test feature and reset switch.

.1 Units shall include a 15A grounded duplex decora receptacle, a button to test operation of
.2 unit and current transformer and sensing mechanism. Unit to be complete with suitable outlet
box.

.3 Units in Hospitals to be hospital grade.

.4 Unless noted otherwise, unit shall trip at 6 mA.

.5 Where shown in outdoor locations, units shall be enclosed in weatherproof surface-mounted
.6 enclosures. In other locations units shall be furnished with stainless steel cover plate.

Standard of Acceptance

- Pass & Seymour 1595HG
- Harvey Hubbell of Canada Ltd. GFR8200 Series
- Bryant Electric GF82 Series
- Leviton 7599-HG
- Cooper VGFH15

PART - 3

3.1

EXECUTION

.1

INSTALLATION

.1

Switches

.2

.3

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.

.1

Mount toggle switches at height specified in Section 26 05 01 - Electrical General Requirements or as indicated.

.2

.3

Receptacles

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

Mount receptacles at height specified in Section 26 05 01 - Electrical General Requirements or as indicated.

For each type of receptacle 20 ampere or larger, supply and hand to Owner two heavy duty caps.

For each type of receptacle 30 ampere or larger, supply and hand to Owner two heavy duty caps.

Connect receptacle grounding terminal to the outlet box with an insulated green ground strap.

Exact position of service fittings shall be verified to suit furniture layout.

.4 Do not mount receptacles directly on a column, unless column has been
.5 appropriately furred, to avoid breaking fire barrier.

Cover Plates

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

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

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

.2 Install explosion proof wiring and devices in hazardous locations of Class, Division and Group
.3 as indicated on Drawings.

.4 Ground fault circuit interrupters:

.5 Mount receptacles at height indicated in Section 26 05 01 - Electrical General
.1 requirements or as indicated.

Outlets in Movable Partitions

.6 Co-ordinate installation of outlet boxes and conduits with the particular trade
.1 involved.

END OF SECTION

OCCUPANCY SENSOR SWITCHES 26 27 27

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.
- .2 Conform to Section 26 01 01, Electrical General Requirements.

1.2 WORK INCLUDED

- .1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete systems as shown as specified and as otherwise required.

1.3 GENERAL DESCRIPTION

- .1 The Lighting Control System is to be a complete motion sensing system. All components and services described herein are part of the Division 26 scope.
- .2 The system and services are comprised of, but not limited to, the following main components
 - .1 Power and auxiliary relay packs.
 - .2 Ultrasonic Occupancy sensors.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01300 - Shop Drawings, Product Data, Samples and Mock-ups and Section 26 01 01 Electrical General Requirements.
- .2 Drawings to include electrical detail of, relay type and quantity, ampacity, power supplies, enclosure construction and dimensions.
- .3 Submit typical wiring diagrams for all components including, but not limited to, relays, occupancy sensors.

1.5 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 16010 Electrical General Requirements.

1.6 MAINTENANCE MATERIALS

- .1 Provide maintenance materials as required and as specified in Section 26 01 01 Electrical General Requirements.

1.7 OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Provide operating and maintenance instructions as specified in Section 26 01 01 Electrical General Requirements.

PART - 2 PRODUCTS

2.1 OVERVIEW DESCRIPTION

- .1 The lighting control system consists of occupancy sensors and auxiliary relay packs.

Standard of Acceptance

- ° **Wattstopper** (or approved equal by Consultant)

- .2 Occupancy sensors, and relay packs shall be mounted in the spaces as indicated. Low voltage wiring from the switches and sensors to the relay packs shall be installed in conduit.

- .3 Each low voltage wire shall be labeled with the relay number at each switch or sensor. Use only properly color coded, stranded #20 AWG (or larger) wire. All relays and switches shall be tested after installation to confirm proper operation and the loads recorded on the directory card in each panel.

2.2 SYSTEM OPERATION

- .1 Lighting in areas shown on drawings is to be turned on and turned off by the occupancy sensors after an adjustable 3 minute to 30 minute delay of no action within the space. The system is to be programmed so if there is activity detected by an occupancy in a room that is accessible via another room(s) and not the corridor, then the lights will remain on the adjacent room(s)

2.3 AUXILIARY RELAY PACKS

- .1 Lighting control relay power packs shall have a 120-24 volt transformer for control of 120 volt lighting.
- .2 The power pack shall be plenum rated with teflon coated low voltage leads and plenum rated plastic housed in a ABS, UL-rated 94V-0 enclosure.
- .3 Switching the relay shall be accomplished with ONE signal wire and a common return. The signal wire shall be able to signal ON and OFF and shall also carry status current that indicates if the relay is ON or OFF.

2.4 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 01 01 - Electrical General Requirements.

2.5 SWITCH PLATES

- .1 Select switch plates to suit number of switches as shown on the plans. Up to 3 switches can be installed in a 1 gang box.
- .2 All switch plates are to be made of stainless steel

- .3 Provide switch plates for combination of low voltage switches and line voltage dimmer as shown on the drawings.

2.6 OCCUPANCY SENSORS

- .1 All ceiling mounted occupancy sensors to be ultrasonic, equal to Watt Stopper WT or UT-300 series.
- .2 Ceiling sensors shall be sized for the particular room controlled, with sufficient coverage area to permit site adjustment to particular occupancy patterns and room layouts.
- .3 All wall sensors are to be passive inferred, equal to Watt Stopper WA-200 series. Mount sensor at a high level above the latching side of the door. Wall sensors are to be complete with manual override.
- .4 Sensors to be integrated into the system that they can provide both on/off switching or off-only switching.
- .5 All sensors shall be directly compatible with the power and auxiliary relay packs described above and shall wire directly to the relays without any auxiliary components or devices above the ceiling.
- .6 Sensitivity and time delay adjustments shall be readily accessible to the user with LED indication of sensed movement to simplify set up.
- .7 User adjustable time delay shall be from 30 seconds to 30 minutes.

2.7 SYSTEM START UP SERVICES

- .1 Manufacturer to provide a factory authorized technician to confirm proper installation and operation of all system components.
 - .1 Typical wiring diagrams for each component.
- .2 Manufacturer to provide, install and commission system programming including:
 - .1 Wiring documentation
- .3 Notify Consultant and Commissioning Agent of testing schedule prior to any testing.

PART - 3 EXECUTION

3.1 INSTALLATION

- .1 Provide motion sensing switching of the type designated in locations as shown on the drawings.
- .2 Provide wiring as recommended by the manufacturer. Low voltage wiring to local control devices to be installed in conduit. Adhere to manufacturer's recommendations as to maximum wire length and maximum quantity of relays per switch.

END OF SECTION

WIRE AND BOX CONNECTORS 0-1000 V
26 27 28

PART - 1 GENERAL

1.1 REFERENCES

- .1 CSA C22.2 No.65-93 (R1999) Wire Connectors.
- .2 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

PART - 2 PRODUCTS

2.1 MATERIALS

- .1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for copper conductors or bars
 - .2 Clamp for copper conductors or bars.
 - .3 Stud clamp bolts.
 - .4 Bolts for copper conductors or bars.
 - .5 Sized for conductors or bars as indicated or required.
- .4 Clamps or connectors for armoured cable, mineral insulated cable, and flexible conduit, as required.

PART - 3 EXECUTION

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 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.
 - .2 Install fixture type connectors and tighten. Replace insulating cap.
 - .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.
 - .4 Install crimp type connectors.
- .2 Install box connectors.

END OF SECTION

**DISCONNECT SWITCHES UP TO 1000 VOLTS
26 27 33**

PART - 1 GENERAL

1.1 REFERENCES

- .1 CSA C22.2 No. 4-M89 Manual Switches.
- .2 CSA C22.2 No. 39 Fuse Holder Assemblies.
- .3 Section 26 28 13 Fuses - Low Voltage

1.2 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.
- .2 Conform to Section 26 05 01, Electrical General Requirements.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 26 05 01 Electrical General Requirements.
- .2 Nameplates shall be in accordance with Article "Equipment Identification".

1.4 WORK INCLUDED

- .1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete systems as shown as specified and as otherwise required.

1.5 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 26 05 01 Electrical General Requirements.

1.6 MAINTENANCE MATERIALS

- .1 Provide maintenance materials as required and as specified in Section 26 05 01 Electrical General Requirements.

1.7 OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Provide operating and maintenance instructions as specified in Section 26 05 01 Electrical General Requirements.

PART - 2 PRODUCTS

2.1 DISCONNECT SWITCHES

- .1 Fusible and non-fusible disconnect switch in sprinkler proof EEMAC 3 enclosure, size as indicated.
- .2 2 pole or 3 pole as required for single phase or three phase circuits

- .3 2 pole with solid neutral or 3 pole with solid neutral for three wire and four wire circuits with neutral
- .4 6 pole for two speed motor applications
- .5 Provision for padlocking in off switch position.
- .6 Mechanically interlocked door to prevent opening when handle in ON position.
- .7 Fuses: size as indicated, to Section 26 28 13 - Fuses - Low Voltage.
- .8 Fuseholders: suitable without adaptors, for type and size of fuse indicated.
- .9 Heavy Duty, quick-make, quick-break action.
- .10 ON-OFF switch position indication on switch enclosure cover.
- .11 Complete with auxiliary NO/NC contact for hydraulic elevator motors.

Standard of Acceptance

- Square D Company (Canada) Ltd.
- Cutler Hammer
- Siemens Canada Ltd.
- Federal Pioneer Ltd.

2.2 THREE POLE DOUBLE THROW SWITCHES

- .1 Non-fusible manual load transfer switch in sprinkler proof EEMAC 3 enclosure, size as indicated.
- .2 Continuous duty rated and suitable for switching HP loads
- .3 Visible blades for positive indication that switch is in the OFF position
- .4 Provision for padlocking in the centre OFF switch position, and in the ON positions.
- .5 Heavy Duty, quick make, quick break operating mechanism
- .6 Phenolic insulating bases
- .7 Compression lugs for switches over 100A
- .8 Mechanically interlocked door to prevent opening when handle in ON position.
- .9 ON-OFF-On switch position indication on switch enclosure cover.

Standard of Acceptance

- Square D Company (Canada) Ltd.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Electrical General Requirements.
- .2 Indicate name of load controlled on size 4 nameplate.

PART - 3 EXECUTION

3.1 INSTALLATION

- .1 Install disconnect switches complete with fuses.

END OF SECTION

FUSES – LOW VOLTAGE
26 28 13

1.1 **GENERAL**

1.2 **REFERENCES**

- .1 To CAN/CSA Standard C22.2 No. 106-M90.

1.3 **SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 26 05 01.
.2 Submit fuse performance data characteristics for each fuse type and size above 200 A. Performance data to include: average melting time-current characteristics, I²t (for fuse coordination), and peak let-through current.

1.4 **MAINTENANCE MATERIALS**

- .1 Provide maintenance materials in accordance with Section 26 05 01.
.2 Six spare fuses of each type and size installed up to and including 600 A.

1.5 **DELIVERY AND STORAGE**

- .1 Ship fuses in original containers.
.2 Do not ship fuses installed in motor control centres, or disconnect switches.
.3 Store fuses in original containers in storage cabinet.

PART - 2 PRODUCTS

2.1 **FUSES GENERAL**

- .1 Fuse type references L1, L2, J1, R1 etc. have been adopted for use in this specification.
.2 Fuses: product of one manufacturer
.3 Fuses rated to 600A shall be CSA certified HRCI-J.
.4 Fuses rated 601A and above shall be CSA certified HRCI-L.

2.2 **FUSE TYPES**

- .1 HRCI-J fuses, current limiting, time delay, with blown fuse indication

Standard of Acceptance

- Ferraz Shawmut: Ampttrap 2000 type AJT
- Bussman: LPJ
- Littlefuse: JTD ID series

- .2 HRCI-L fuses, current limiting, time delay.

Standard of Acceptance

- Ferraz Shawmut: Ampttrap 2000 type A4BQ

- Bussman: KRP-C
- Littlefuse: KLPC Series Power-Pro

2.3 FUSE STORAGE CABINET

- .1 Fuse storage cabinet, manufactured from 2.0 mm thick aluminum 750 mm high, 600 mm wide, 300 mm deep, hinged, lockable front access door finished in accordance with Section 26 05 01 - Electrical-General Provisions.

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
- .3 Ensure correct fuses fitted to assigned electrical circuit.
- .4 Provide a spare set of six fuses of each size and type installed on the project [and turn over to Owner] [and locate in fuse storage cabinet].
- .5 Mount fuse storage cabinet on wall [in main electrical room] [in maintenance shop] [as directed on site by Owner's maintenance personnel]

END OF SECTION

MOULDED CASE CIRCUIT BREAKERS
26 28 16

PART - 1 GENERAL

1.1 REFERENCES

- .1 CAN/CSA C22.2 No. 5.1. Moulded case circuit breakers.

1.2 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.
- .2 Conform to Section 26 05 01, Electrical General Requirements.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 26 05 01 Electrical General Requirements.
- .2 Nameplates shall be in accordance with Article "Equipment Identification".
- .3 Include time-current characteristic curves for breakers with ampacity of 200 A and over or with interrupting capacity of 22,000 A symmetrical (rms) for 120/208 volt and 25,000 A symmetrical (rms) for 600 volt..

1.4 WORK INCLUDED

- .1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete systems as shown as specified and as otherwise required.

1.5 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 26 05 01 Electrical General Requirements.

1.6 MAINTENANCE MATERIALS

- .1 Provide maintenance materials as required and as specified in Section 26 05 01 Electrical General Requirements.

1.7 OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Provide operating and maintenance instructions as specified in Section 26 05 01 Electrical General Requirements.

PART - 2 PRODUCTS

2.1 BREAKERS GENERAL

- .1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation.
- .2 Common-trip breakers: with single handle for multi-pole applications.

- .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 5 - 10 times current rating.
- .4 Circuit breakers with interchangeable trips over 150 A.
- .5 25,000 Amps symmetrical interrupting rating at 600 volts

2.2 **THERMAL MAGNETIC BREAKERS**

- .1 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.

2.3 **SOLID STATE TRIP BREAKERS**

- .1 Moulded case circuit breaker to operate by means of a solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous tripping for phase, ground fault and short circuit protection.

2.4 **FEATURES**

- .1 Include
 - .1 on-off locking device
 - .2 handle mechanism

2.5 **ENCLOSURE**

- .1 Mount individually mounted breakers in CEMA 3 enclosure.

PART - 3 EXECUTION

3.1 **INSTALLATION**

- .1 Install circuit breakers as indicated.

END OF SECTION

**GROUND FAULT CIRCUIT INTERRUPTERS
26 28 19**

PART - 1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 26 05 01 Electrical General Requirements.

PART - 2 PRODUCTS

2.1 BREAKER TYPE GROUND FAULT INTERRUPTER

- .1 Single or Two pole ground fault circuit interrupter for 15A, 120 or 208V, 1 phase circuit c/w test and reset facilities.

2.2 RECEPTACLE TYPE GROUND FAULT INTERRUPTER

- .1 Unit shall include a 15A grounded duplex receptacle, a button to test operation of unit and current transformer and sensing mechanism. Unit to be complete with suitable outlet box.
- .2 Units in Hospitals to be hospital grade.
- .3 Unless noted otherwise, unit shall trip at 6 mA.
- .4 Where shown in outdoor locations, units shall be enclosed in weatherproof surface-mounted enclosures. In other locations units shall be furnished with stainless steel coverplates.

Standard of Acceptance

- Bryant #GFR82 Series
- Pass & Seymour #2091-S
- Hubbell #GF8200 Series

PART - 3 EXECUTION

- .1 Installation
- .2 Provide dedicated branch wiring neutral conductor for each individual breaker type ground fault interrupter.
- .3 Do not ground neutral on load side of ground fault relay.
- .4 Connect wiring to equipment in accordance with manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Electrical - General Requirements.
- .2 Demonstrate simulated ground fault tests.

END OF SECTION

LIGHTING

26 51 13

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Conform with the requirements of Section 26 05 01 Electrical General Requirements.

1.2 WORK INCLUDED

- .1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete Electrical systems as shown, as specified and as otherwise required. Complete systems shall be left ready for continuous and efficient satisfactory operation.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Section 26 05 01 Electrical General Requirements - Shop Drawings and Product Data.
- .2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Consultant.
- .3 Photometric data to include:
- .4 Total input watts, candlepower summary, candela distribution zonal lumen summary, luminaire efficiency, CIE type, coefficient of utilization, lamp type and lumen rating in accordance with IESNA testing procedures.

1.4 REQUIREMENTS

- .1 Luminaires shall not be delivered to building or stored therein until dry and protected space is available for proper storage of luminaires.
- .2 Submit samples of luminaires which are not catalogue items for approval. Additional luminaires shall not be manufactured until sample has been approved. Each approved sample shall be retained on job site until final completion of project. Luminaires which do not match quality and workmanship of standard sample will be rejected.
- .3 Finishes of luminaires, as specified in the "Luminaire List" must be maintained. Where the description of the luminaire directs a "colour/ finish to suit Architect" it is to be understood that during construction the final colour/finish will be selected. The Architect must be permitted to make their choice from a standard colour/finish range but the selected colour will apply to all of the particular type of luminaire unless otherwise specified.
- .4 "Allowances" when shown, are in Canadian dollars and cover the cost of the lighting luminaires and lamps. Allowances do not include applicable taxes, delivery to the site, handling, installation, overhead or profit.

1.5 SUBSTITUTIONS

- .1 Luminaires included under this Section are specified by approved manufacturer and type. Furnish equipment, as specified, unless substitutions are mutually agreed upon, as follows:
- .2 During the construction period, no substitutions shall be considered unless compelling reasons are given such as inability to meet delivery schedule. This reason shall not be acceptable if delay is caused by Contractor's failure to order luminaires in accordance with

the schedule. In such cases, it is the Contractor's responsibility to provide luminaires as specified without delay to the project and without additional cost to the Owner.

- .3 Substitutions shall be named, samples, catalogue cuts and complete photometric reports submitted, and cost savings documented. Submit a written request for proposed luminaires to be substituted to Lighting Consultant at least two weeks before the end of the bid period. Make the request an alternate, separate proposal, accompanied by complete descriptive and technical data. Indicate addition or deduction from the base bid. Substitutions proposed less than two weeks before the end of the bid period, or not including proper documentation shall not be considered. Lighting Consultant shall accept or reject proposed substitutions.
- .4 Where proposed substitutions alter functional or visual design, or change the space requirements or mounting details indicated here or on the drawings, detail such changes in the proposal and include costs for revised design and construction for trades involved.
- .5 Reimburse Consultant and Sub-Consultants for costs of evaluating proposed substitutions, after the bid period, whether or not such substitutions are accepted.

PART - 2 PRODUCTS

2.1 GENERAL

- .1 Similar luminaires shall be products of same manufacturer.
- .2 Luminaires shall be suitable for individual or continuous mounting.
- .3 Supply recessed luminaires, where installed in plaster or in acoustic ceilings, complete with plaster trim frame or ring and mounting brackets.
- .4 Fluorescent troffers in ceiling shall be equipped with adjustable mounting brackets.
- .5 Luminaires shall be completely assembled in factory and shall be delivered to building in cartons or in palletized form, as directed.

2.2 LAMPS

- .1 Light Emitting Diodes (Accent/Decorative)
 - .1 Greater than 50 lumens per watt
 - .2 30 to 40 lumens per watt (3200°K)
 - .3 0.5 to 1 watt per LED chip
 - .4 Bin number requirements for colour temperature consistency
 - .5 Maximum temperature at the base of the "LED cap" mounted to the sub-strate shall be controlled to ensure full lamp life.
 - .6 Warranty: 5 years

Standard of Acceptance LED Drivers shall be high frequency to prevent "FLICKER"

Standard of Acceptance - Driver Acceptance

- Advance
- Lite Tech
- VLM (Italy)
- Lumi-Drives (UK)
- Osram

Standard of Acceptance - Lamp Acceptance:

- Cree
- Lumileds
- Nichia
- Osram

2.3 LENSES

- .1 K12 distribution acrylic lenses. 3.2mm (125") thick, shall have a recessed prismatic pattern of 5mm (3/16") square based female cones running 45° to the parallel and perpendicular axis to the panel. Panel shall be made of ultraviolet inhibited injection moulded clear virgin acrylic.
- .2 Panels shall be strain-free and uniform in production. There shall be no fade-outs or streaks to detract from job performance.
- .3 Lenses shall be low brightness, sparkling crystal panel that provides maximum efficiency and good brightness control in the direct glare zone.

Standard of Acceptance

- A.L.P. Lighting and Ceiling Products
- I.C.I. Acrylics Canada Inc.
- Holophane Canada Inc.

PART - 3 EXECUTION

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Locate hangers on tile centres or intersections. Mount recessed incandescents, troffers and surface mounted luminaires in or on full tiles.
- .3 Verify quantity of luminaires before placing orders.
- .4 Verify ceiling types with the latest revised Architectural Drawings and order luminaires to suit the correct ceiling.
- .5 Check lighting luminaires and mountings for their electrical and physical characteristics in relation to conditions due to building construction and mechanical equipment. Make necessary adjustments to luminaires or hanging arrangement without expense to Owners. Give notification at time of shop drawings and before construction if decision on necessary changes is required.
- .6 Co-operate with other trades to ensure proper installation of lighting luminaires.
- .7 Carefully align luminaires, shown in continuous lines or rows, so that rows appear as straight lines.
- .8 Mount luminaires perfectly level or plumb. Luminaires shall fit tightly to ceiling without showing a space or light leak between frame and ceiling.
- .9 Take down any improperly installed luminaires and re-install without expense to Owner.
- .10 Standard octagonal boxes may be supplied where conduits feeding luminaires in finished areas are exposed on ceiling if hanger canopies entirely cover outlet boxes and are neatly notched for conduit. Otherwise, provide cast conduit outlet boxes with a diameter larger than canopies.

- .11 Attach boxes or hickies directly to poured concrete with 6mm (¼") minimum diameter bolts and lead expansion anchors where luminaires are suspended directly from concrete slabs. Use 8mm (5/16") minimum bolts through precast slabs, welded to 100mm x 100mm (4" x 4") minimum, 3.5mm (10 gauge) plate above slabs.
- .12 Do not mount luminaires above pipes, ducts or equipment. In event of unavoidably tight locations, provide hangers to clear obstructions. Check layouts of other trades on job and plan co-operatively. Luminaires in any room shall hang at one height. Obtain approval before any changes are made to layouts shown
- .13 All luminaires mounted in or on ceilings shall be supported independently of ceiling by means of chains.
- .14 Provide continuous 12mm x 38mm (½" x 1½") channel above the ceiling, where luminaires are suspended or mounted on furred ceilings. Fasten luminaires to channel with two 6mm (¼") minimum diameter studs with minimum 1220mm (4'- 0") on centre.
- .15 Luminaires installed in or on "T" bar ceilings shall be equipped with safety chains anchored in an approved manner to the floor slab or roof structure above. Fluorescent luminaires shall have two chains, each supporting two corners of the luminaire. Chain shall be #10 Tensile jack chain, installed as noted below.
- .16 Chain shall be No. 10 Tensile jack chain, bright zinc coated, with a strength of 180 kg (400 lbs.) where luminaires are indicated to be chain hung. Attachments shall be made using a No. 10 "S" hook. Caddy fasteners may be used where applicable. "S" hooks must be closed after installation.
- .17 Industrial luminaires where suspended shall be 12mm (½") conduit hangers and ARB ball aligners. Length and location shall clear equipment, ducts and pipes. Metal strut (Flexibar or equal) may be used for mounting of luminaires in mechanical areas and electrical rooms.

3.2 **LIGHTING LUMINAIRES**

- .1 Provide lighting luminaires exactly as shown and as specified in the following schedule. Luminaires shall be complete with necessary accessories and lamps at time of acceptance.
- .2 All luminaires shall be ULC or CSA certified.
- .3 Each fluorescent luminaire installed on branch circuits with voltage exceeding 150 volts-to-ground shall be provided with a disconnecting means integral to the luminaire that simultaneously opens all circuit conductors between the branch circuit conductors and the supplying ballast(s) and marked in a conspicuous, legible and permanent, manner adjacent to the disconnecting means, identifying the specific purpose in accordance with the Canadian Electrical Code Part 1 Rule 30-308(4).

3.3 **LUMINAIRE LIST**

- .1 Luminaire manufacturers are listed in alphabetical order and not in order of preference.

Title	Description	Lamp Schedule
LA	<p>Recessed 2'-0" x 2'-0" LED Ambient luminaire. Luminaire shall be complete with one piece lens door assembly. Luminaire shall be suitable for a 'T'-bar ceiling.</p> <p>Luminaire shall be suitable for a "T-bar ceiling.</p> <p>Luminaire shall include dimmable LED Driver</p> <p>Voltage: 120 volt</p> <p>Manufacturers: Focal Point FAML-22-ACR-4000LH-35K-1C-120-LDI-G-WH</p> <p>Note: Include in the Contract an additional TWO (2) spare Type 'LA' luminaires including installation (include an average of 20'0" of wire in conduit for each additional luminaire and connection to an adjacent circuit). Assume, for bidding purposes, that these luminaires can be added at any time during construction including at the end of the construction and in any location as directed on site. Any luminaires not installed shall be turned over to the Hospital</p>	45 Watt, 3500 K integral LED
LA1	<p>Recessed 1'-0" x 4'-0" x 4-3/4" D (maximum) direct/indirect LED luminaire. Luminaire shall be complete with one piece lens door assembly. Luminaire shall be suitable for a 'T'-bar ceiling.</p> <p>Luminaire shall include dimmable LED Driver</p> <p>Voltage: 120 Volt</p> <p>Manufacturers: Focal Point #FAM2-14-ACR-4000L-35K-1C-120-L11-G-WH</p>	34 Watt, 3500K LED
LA2	<p>Recessed 2'-0" x 4'-0" x 4-3/4" D (maximum) direct/indirect LED luminaire. Luminaire shall be complete with one piece lens door assembly. Luminaire shall be suitable for a 'T'-bar ceiling.</p> <p>Luminaire shall include dimmable LED Driver</p> <p>Voltage: 120 Volt</p> <p>Manufacturers: Focal Point #FAM2-24-ACR-4000L-35K-1C-120-L11-G-WH</p>	34 Watt, 3500K LED

Title	Description	Lamp Schedule
LB	<p>Recessed 4" (nominal) round LED downlight complete with clear polycarbonate lens and 0-10 volt dimming driver digitally controlled dimming driver.</p> <p>Luminaire shall be suitable for a drywall or T-bar ceiling.</p> <p>Luminaire shall include dimmable LED Driver</p> <p>Voltage : 120 volt</p> <p>Manufacturer:</p> <p>Kenall #MDL4-DCFW-28L-35K8-CSS-RIG4-120-DIM</p> <p>Note: Include in the Contract an additional TWO (2) spare Type 'LB' luminaires including installation (include an average of 20'0" of wire in conduit for each additional luminaire and connection to an adjacent circuit). Assume, for bidding purposes, that these luminaires can be added at any time during construction including at the end of the construction and in any location as directed on site. Any luminaires not installed shall be turned over to the Hospital</p>	28 Watt, 3500K LED
LC	<p>Recessed 4" wide x 6'-0" long linear LED with direct distribution, standard flush mounting and white diffuser</p> <p>Luminaire shall include dimmable LED Driver and suitable for installation in lay-in t-bar ceiling</p> <p>Manufactures :</p> <p>Finelite #HP-4-R-4ft-S-F-96LG-120-FC-10%-SF-GE</p>	3500K LED
LC1	<p>Recessed 4" wide x 8'-0" long linear LED with direct distribution, standard flush mounting and white diffuser</p> <p>Luminaire shall include dimmable LED Driver and suitable for installation in lay-in t-bar ceiling</p> <p>Manufactures :</p> <p>Finelite #HP-4-R-4ft-S-F-96LG-120-FC-10%-SF-GE</p>	3500K LED

Title	Description	Lamp Schedule
LC2	<p>Recessed 4" wide x 4'-0" long linear LED with direct distribution, standard flush mounting and white diffuser</p> <p>Luminaire shall include dimmable LED Driver and suitable for installation in linear metal ceiling</p> <p>Manufactures : Finelite #HP-4-R-4ft-S-F-96LG-120-FC-10%-SF-GE</p>	3500K LED
LC3	<p>Recessed 4" wide x 2'-0" long linear LED with direct distribution, standard flush mounting and white diffuser</p> <p>Luminaire shall include dimmable LED Driver and suitable for installation in linear metal ceiling</p> <p>Manufactures : Finelite #HP-4-R-4ft-S-F-96LG-120-FC-10%-SF-GE</p>	3500K LED
LD	<p>Recessed 2'-0" x 2'-0" LED Patient luminaire. Luminaire shall be complete with one piece lens door assembly. Luminaire shall be suitable for a 'T'-bar ceiling.</p> <p>Luminaire shall be suitable for a "T-bar ceiling.</p> <p>Luminaire shall include dimmable LED Driver</p> <p>Voltage: 120 volt</p> <p>Manufacturers: Kenal #MAC-22-FA-45L-35K-DCC-120-AC-AMF</p> <p>Note: Include in the Contract an additional ONE (1) spare Type 'LD' luminaire including installation (include an average of 20'0" of wire in conduit for each additional luminaire and connection to an adjacent circuit). Assume, for bidding purposes, that these luminaires can be added at any time during construction including at the end of the construction and in any location as directed on site. Any luminaires not installed shall be turned over to the Hospital</p>	3500K LED

Title	Description	Lamp Schedule
LE	<p>Recessed 2'-0" x 2'-0" LED luminaire with antimicrobial finish on exposed surfaces, smooth diffused acrylic lens securely fastened in a stainless steel frame with internal hinge design and captive mounted head stainless steel fasteners. The lens frame shall be gasketed with a closed cell silicone gasket that seals the lens to the frame of the housing.</p> <p>Luminaire shall provide a wide symmetrical diffused DR acrylic Optics (KORE Technology)</p> <p>Luminaire shall be suitable for a drywall ceiling.</p> <p>Luminaire shall include dimmable LED Driver</p> <p>Voltage: 120 Volt</p> <p>Manufacturers: Kenall #MPCADE-22-G-25L/45L-35K8-DCC-120-AC-AMF</p> <p>Note: Include in the Contract an additional ONE (1) spare Type 'LE' luminaire including installation (include an average of 20'0" of wire in conduit for each additional luminaire and connection to an adjacent circuit). Assume, for bidding purposes, that these luminaires can be added at any time during construction including at the end of the construction and in any location as directed on site. Any luminaires not installed shall be turned over to the Hospital</p>	48 Watt, integral LED

Title	Description	Lamp Schedule
LF	<p>Recessed 6" (nominal) round LED downlight complete with clear polycarbonate lens and 0-10 volt dimming driver digitally controlled dimming driver.</p> <p>Luminaire shall be suitable for a drywall or T-bar ceiling.</p> <p>Luminaire depth shall not exceed 5.5"</p> <p>Luminaire shall include dimmable LED Driver</p> <p>Voltage : 120 volt</p> <p>Manufacturer: Kenall #M4DL6-R-DCFW-33L-35K9-W-CSS-RSI6-120-DIM1</p> <p>Note: Include in the Contract an additional TWO (2) spare Type 'LF' luminaires including installation (include an average of 20'0" of wire in conduit for each additional luminaire and connection to an adjacent circuit). Assume, for bidding purposes, that these luminaires can be added at any time during construction including at the end of the construction and in any location as directed on site. Any luminaires not installed shall be turned over to the Hospital</p>	28 Watt, integral LED

Title	Description	Lamp Schedule
LG	<p>Recessed 4'-0" x 4'-0" LED, "Luminous SkyCeiling" luminaire with smooth, acrylic graphic "SkyTile" lens / .125" acrylic exam lenses, securely fastened in an aluminum regressed frame with internal hinge design. The lens frame shall be gasketed with a closed cell silicone gasket that seals the lens to the frame of the housing.</p> <p>The lens included in the ceiling scene element shall have an art pattern electronically printed on it to provide an illuminated "picture". Final image to be selected by the Architect.</p> <p>Luminaire shall be suitable for a drywall ceiling.</p> <p>The "Luminous SkyCeiling" Light portions shall be dimmable</p> <p>Luminaire to be complete with Sky Factory 24PS-HGL Dimmable Power System</p> <p>Voltage: 120 volt</p> <p>Manufacturers:</p> <p>Sky Factory #EP44-RVN-EP44-hard ceiling installation</p> <p>Notes:</p> <p>1: The Division 26 Contractor is to confirm co-ordination of luminaire and ceiling.</p> <p>2: Contact at Sky Factory is : Aaron Birlson, SkyDesigner, SKY FACTORY p: <u>+1 (866) 759 3228</u> ext 210 e: <u>aaronb@skyfactory.com</u></p>	integral 6500K LED as required

Title	Description	Lamp Schedule
LG1	<p>Recessed 4'-0" x 6'-0" LED, "Luminous SkyCeiling" luminaire with smooth, acrylic graphic "SkyTile" lens / .125" acrylic exam lenses, securely fastened in an aluminum regressed frame with internal hinge design. The lens frame shall be gasketed with a closed cell silicone gasket that seals the lens to the frame of the housing.</p> <p>The lens included in the ceiling scene element shall have an art pattern electronically printed on it to provide an illuminated "picture". Final image to be selected by the Architect.</p> <p>Luminaire shall be suitable for a drywall ceiling.</p> <p>The "Luminous SkyCeiling" Light portions shall be dimmable</p> <p>Luminaire to be complete with Sky Factory 24PS-HGL Dimmable Power System</p> <p>Voltage: 120 volt</p> <p>Manufacturers:</p> <p>Sky Factory #EP44-RVN-EP44-hard ceiling installation</p> <p>Notes:</p> <p>1: The Division 26 Contractor is to confirm co-ordination of luminaire and ceiling.</p> <p>2: Contact at Sky Factory is : Aaron Birlson, SkyDesigner, SKY FACTORY p: <u>+1 (866) 759 3228</u> ext 210 e: <u>aaronb@skyfactory.com</u></p>	

Title	Description	Lamp Schedule
LG2	<p>Recessed 4'-0" x 6'-0" LED, "Luminous SkyCeiling" luminaire with smooth, acrylic graphic "SkyTile" lens / .125" acrylic exam lenses, securely fastened in an aluminum regressed frame with internal hinge design. The lens frame shall be gasketed with a closed cell silicone gasket that seals the lens to the frame of the housing.</p> <p>The lens included in the ceiling scene element shall have an art pattern electronically printed on it to provide an illuminated "picture". Final image to be selected by the Architect. (Image could be different from Luminaire Type 'LG1')</p> <p>Luminaire shall be suitable for a drywall ceiling.</p> <p>The "Luminous SkyCeiling" Light portions shall be dimmable</p> <p>Luminaire to be complete with Sky Factory 24PS-HGL Dimmable Power System</p> <p>Voltage: 120 volt</p> <p>Manufacturers:</p> <p>Sky Factory #EP44-RVN-EP44-hard ceiling installation</p> <p>Notes:</p> <p>1: The Division 26 Contractor is to confirm co-ordination of luminaire and ceiling.</p> <p>2: Contact at Sky Factory is : Aaron Birlson, SkyDesigner, SKY FACTORY p: <u>+1 (866) 759 3228</u> ext 210 e: <u>aaronb@skyfactory.com</u></p>	integral 6500K LED as required

Title	Description	Lamp Schedule
LH	<p>Ceiling mounted, aimable, dimmable, high intensity Adjustable LED Lighting System. Luminaire shall be complete with gasket between the lens and lens-frame. Luminaire shall be complete with “Antimicrobial Finish”</p> <p>The luminaire is to be equipped with an optical sensor, to permit the positioning of the lighthouse, for additional intensity or where angular lighting is desirable, by a <u>hand held</u> remote control.</p> <p>The system should also include a flush mounted “wall controller” intensifier that provides individual positioning of each lighthouse as well as uniform intensity adjustment for all lighthouses.</p> <p>The luminaire is to produce a minimum of <u>2,500 footcandles per lighthouse</u> at a colour temperature of 3,500 Kelvin. Each unit is to provide cool, colour-corrected light that diffuses evenly.</p> <p><u>The lighting unit may require an in-ceiling support system provided by other Divisions.</u> However, this Division is responsible for fully coordinating the installation. Retain the services of the light supplier to assist in on-site coordination and to supervise the installation of each unit.</p> <p>Luminaires shall be suitable for Drywall Ceiling.</p> <p>The exact location of the examination lights to be determined as per manufacturer’s recommendations prior to installation. Installation of these Lights will require full coordination on site.</p> <p>Provide one wand plus one spare wand.</p> <p>Voltage: 120 volt</p> <p>Manufacturer: Kirlin (InfraLED Series) #PRO-19045 -35K-47</p>	Provided with the Luminaire
LJ	<p>Suspended or Surface Mounted, industrial type luminaire (+/- 50” long x 8” wide). Luminaires shall be suspended from ceiling/structural steel at a height that avoids interference with mechanical/electrical equipment. Mount luminaires with a chain suspension system.</p> <p>Manufacturers: Pioneer #STO-0850-5.4L-3500-UNV Lithonia #VAP-4000LM-PCL-MD-120V-35K-90CRI</p>	39 watt, Integral 3500K LED

Title	Description	Lamp Schedule
LK	<p>Surface mounted LED undercabinet luminaire. Luminaire shall be 48" long suitable secured to the underside of the metal shelf, Extruded aluminum housing, soft focus lensing and 350mA operating current. LED spacing is 100mm along length of extrusion. Nominal dimensions of 22mm width x 8mm height. Run lengths shown on drawings, install as per manufactures instructions for even illumination on task surface.</p> <p>Luminaire to be complete with Remote Driver. Electrical Contractor to locate the power supply in an inconspicuous location and to coordinate driver location with architect and manufacturer, and shall provide all mounting hardware and assembly requirements for installation</p> <p>Voltage: 120 volts</p> <p>Manufacturers: Capri #CUCL Series Revlite Technologies Inc. # Series 5 - #3014X Danalite: # DL100 Series</p>	1.2 Watt LED 3000 K
LL	<p>Continuous length of +/- 20'-0" consisting of 20 x 12" modules that "join" to make up the total length (length to be confirmed on site) Slim-Line (+/- 2" wide x 1.5" deep) Linear LED Accent Lighting bracket mounted in recessed light cove</p> <p>Luminaire installation requires remote "Power Units" as required</p> <p>GVA Lighting "STR-SLIM-CM-320-3500K-X-ELV48 (120volt)</p> <p>Notes: 1/ Luminaire is to include a five (5) year warranty 2/ Include in the Contract an additional FOUR (4) spare 12" lengths of Type 'LS1' luminaires AND four (4) spare Power Units including installation (include an average of 20'0" of wire in conduit for each additional luminaire and connection to an adjacent circuit). Assume, for bidding purposes, that these luminaires can be added at any time during construction including at the end of the construction and in any location as directed on site. Any luminaires not installed shall be turned over to the Hospital</p>	

Title	Description	Lamp Schedule
LM	<p>Existing Cove Lighting modernization. Contractor is to remove the existing cove louvre and fluorescent striplights and install new linear LED Lighting and new cube louvre</p> <p>Re-connect new lights to existing circuiting</p> <p>Voltage: 120 volt</p> <p>Manufacturer: LinmoreLED #AL-STI-3/4-35K-36W-DF</p> <p>New louvre shall be a continuous (assume 60" length but confirm on site) combination panel of 12" wide (confirm width on site), 1" x 1" x 1" major cell and 1/2" x 1/2" x 1/2" high minor cell white metal interleaf louvre with 45° cut-off for the entire cove. Supports supplied under another Division.</p> <p>Manufacturers: Electra "Luma Mod" or Intalite "Check-Cel"</p>	
X	<p>L.E.D. edge lit exit sign. RECESSED trim plate shall be constructed of brushed aluminum.</p> <p>Two styles of faceplates will be required:</p> <ul style="list-style-type: none"> - stencil without arrows - stencil with universal arrows <p>Voltage: 120 volt</p> <p>Manufacturers:</p> <p>Beghelli "Guida Series" Lumacell "LER 1100 Series" Emergi-lite, Uniglo, Ready-Lite, Dual-lite, Stanpro & Aimlite equal</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. Double face exit sign shall not exceed 5 watts (including transformer). 2. Exit lights shall be listed to CSA Standard #C860. <p>Note:</p> <p>Include in the Contract an additional FIVE (5) spare Type 'X' luminaires including installation (include an average of 20'0" of wire in conduit for each additional luminaire and connection to an adjacent circuit). Assume, for bidding purposes, that these luminaires can be added at any time during construction including at the end of the construction and in any location as directed on site. Any luminaires not installed shall be turned over to the Hospital</p>	-

END OF SECTION

**UNIT EQUIPMENT FOR EMERGENCY LIGHTING
26 52 00**

PART - 1 GENERAL

1.1 REFERENCE

- .1 CSA C22.2 No. 141 Unit Equipment for Emergency Lighting.

1.2 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.
- .2 Conform to Section 26 05 01, Electrical General Requirements.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 26 05 01 Electrical General Requirements.
- .2 Nameplates shall be in accordance with Article "Equipment Identification".

1.4 WORK INCLUDED

- .1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete systems as shown as specified and as otherwise required.

1.5 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 26 05 01 Electrical General Requirements.

1.6 MAINTENANCE MATERIALS

- .1 Provide maintenance materials as required and as specified in Section 26 05 01 Electrical General Requirements.

1.7 OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Provide operating and maintenance instructions as specified in Section 26 05 01 Electrical General Requirements.

1.8 WARRANTY

- .1 For batteries, the 12 months warranty period is extended to 120 months, with a no-charge replacement during the first 60 months and a pro-rate charge on the second 60 months.

1.9 TESTING

- .1 Conduct witnessed testing of battery lighting systems including disconnecting power to each battery unit for the minimum length of time required for full run down time and verify each and every light head. Record exact length of time the battery maintains the full lighting and "certify" both the battery life and remote lighting operation. Notify Consultant and Commissioning Agent of testing schedule prior to conducting tests.
- .2 Submit test reports directly to the Consultant and the Commissioning Agent.

PART - 2 PRODUCTS

2.1 EQUIPMENT

- .1 Supply voltage: 120 V, AC.
- .2 Output voltage: 12 V DC.
- .3 Operating time:
 - .1 12 volt units: 180 watts for 60 minutes.
- .4 Battery: sealed, maintenance free, lead acid or lead calcium.
- .5 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected. Unit shall have externally accessible means for testing of unit and shall have two lamps indicating A.C. on, and high charge. Unit shall include a low voltage cut-off protection circuit and self diagnostic auto test.
- .6 Solid state transfer.
- .7 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .8 Signal lights: solid state, life expectancy 100,000 h minimum, for 'AC Power ON' and 'High Charge'.
- .9 Lamp heads: integral on unit and remote, 360° horizontal and 180° vertical adjustment.
- .10 Lamp type (integral and remote):
 - .1 Finished Areas:
 - (a) Wall mounted adjustable type LED, 12 VDC, glare free mounted in a Lexan cube approximately 113 mm square
- .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .12 Cabinet finish: Painted steel enclosure
- .13 Units shall include "Flasher" remote test system with one hand-held controller.
- .14 Auxiliary equipment for central battery units:
 - .1 Ammeter.
 - .2 Voltmeter.
 - .3 Lamp disconnect switch.
 - .4 Test switch.
 - .5 Time delay relay.
 - .6 Battery disconnect device.
 - .7 ac input and dc output terminal blocks inside cabinet.
 - .8 Shelf.
 - .9 RFI suppressors.

2.2 WIRING OF REMOTE HEADS

- .1 Conduit: type EMT, to Section 26 05 33 - Conduits Fastenings and Fittings.
- .2 RFI suppressors.
- .3 Conductors: RW90 type to Section 26 05 19 - Wires & Cables 0-1000 Volts, sized in accordance with manufacturer's recommendations.

Standard of Acceptance

- o Emergi-Lite
- o Lumacell Inc.
- o Beghelli

PART - 3 EXECUTION

3.1 INSTALLATION

- .1 Provide complete emergency battery lighting system as shown and specified.
- .2 Unless otherwise noted, mount units on the wall 2440mm above floor. Unit shall be hardwired to source. Provide lock-on devices on breakers.
- .3 Where heads are shown remote from unit, provide suitable outlet box at 2440 mm and install head. Connect with conduit to battery and charger unit. Wire size to suit manufacturer's recommendations, but not less than #10 gauge, and for a minimum of 3% voltage drop at remote heads. Ensure remote head wiring lengths are reviewed with manufacturer prior to installation. Voltage drops will be tested by Engineer and Building Inspector. Replace any wiring not passing the 3% voltage drop test with new size and retest.
- .4 Direct heads as indicated. Allow for re-adjustment of head directions as requested by Consultant after completion of emergency light review.

END OF SECTION

INTERCOM SYSTEM
27 05 14

PART 1 - GENERAL

- 1.1 Overview
- .1 Local Intercom Systems shall consist of Intercom Stations, Power Supply and necessary interconnecting cables. Intercom System shall include communication from the Master Station to each Remote Stations. Master Stations are to include a remote door release control
- 1.2 General Requirements
- .1 Conform to Sections of Division 1 as applicable. Conform to Section 16010, Electrical General Requirements. The system shall be CSA and/or UL approved Standard 1069 Hospital Signaling Equipment.
 - .2 Transistors, capacitors, integrated circuits, and other components shall not be operated to exceed their rated values. Design systems for 24-hour continuous operation.
- 1.3 Shop Drawings and Product Data
- .1 Submit shop drawings and product data in accordance with Section 01300 - Shop Drawings, Product Data, Samples and Mock-ups and Section 16010 Electrical General Requirements.
- 1.4 Work Included
- .1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete systems as shown as specified and as otherwise required.
 - .2 System as provided by the manufacturers will include the following:
 - .1 Control equipment including auxiliary power supplies.
 - .2 All system equipment and devices.
 - .3 All wiring required for complete system operation.
- 1.5 Operation of the Intercom System
- .1 To originate a call, a person shall depress a single "call" button.
 - .2 This shall automatically and simultaneously cause the following to occur:
 - .1 Visual and audio signals shall be activated at the remote stations.
 - .2 Visual indication shall be provided at the calling station showing that the call has been placed.
 - .3 Audio & Visual indication shall be provided in the Pharmacy showing that a call has been placed.
 - .4 Necessary circuitry shall be activated to permit a two-way conversation to take place.
 - .3 When the called station is not in a "private" position, it shall now be possible for both parties to engage in a two-way conversation without the need to operate any buttons or controls. At the end of the conversation, either party shall be able to cancel the call.
 - .4 Call cancellation shall be possible by pressing a suitable "Cancel" or "Reset" button, or
 - .5 A called station shall be able to respond to a call by speaking into the built-in speaker microphone

PART 2 - PRODUCTS

2.1 Stations

- .1 Stations shall be wall mounted
- .2 Stations shall incorporate the following features and facilities:
 - .1 Sturdy modern style appearance and colour
 - .2 Solid state circuitry
 - .3 Built-in device to provide tone signal for incoming calls, called station on Privacy, speech channel available.
 - .4 Built-in lights to announce incoming calls or busy exchange.
 - .5 Talk-Listen or Press-To-Talk, Release-To~Listen button.
 - .6 High quality microphone housed behind grille enabling person to answer incoming calls from anywhere within the room.
 - .7 High quality speaker or speakers housed behind grille set to an adequate volume level enabling person called to receive voice message anywhere within the room.
 - .8 Cancel or Release button
 - .9 Privacy button
 - .10 Volume control

2.2 Power Supplies

- .1 The operating voltage shall be obtained from a line supply of 100 - 120 volt, 60 Hz and shall permit satisfactory operation of the exchange with line voltage variations of plus and minus 10%.

2.3 Wiring

- .1 Provide all wiring, conduits, pull boxes, accessories, required for a complete intercom system as shown on the Drawings and specified herein.
- .2 No lubricants other than talc shall be used while drawing wires into the conduit. No spliced joints shall be used on wiring.

2.4 Manufacturer / Supplier

- .1 **The system shall be:
Aiphone 'JP' Series c/w Video, Intercom & Remote Release Control and be as supplied by: Aatel Communications**

PART 3 - EXECUTION

3.1 Installation

- .1 Provide a complete intercom system as shown on Drawings and as specified.
- .1 Wall mounted stations shall be arranged 1350 mm above floor.
- .2 Install ceiling Speakers/ Microphones flush in the ceiling
- .3 Wiring to stations shall be installed in conduit in accordance with the recommendations of the equipment supplier. Wiring shall consist of multi-conductor, colour-coded twisted pairs with a PVC outer jacket. Shielded wiring shall be used where recommended by the manufacturer

END OF SECTION

TELEPHONE & DATA RACEWAYS

27 05 28

PART - 1 GENERAL

1.1 SYSTEM DESCRIPTION

- .1 Empty raceways systems shall consist of outlet boxes, cover plates, conduits, pull boxes, fish wires and service poles.
- .2 Empty conduit systems being installed shall be for installation of wiring installed at a later date by communications contractor:
 - .1 Telephone and data communications systems.

1.2 PRE/ POST OCCUPANCY PROVISIONS

- .1 Assuming the Hospital will, as the time for occupancy approaches or even after occupying, resolve that some additional telephone/ data outlets/ monitor/ CCTV/ Security System outlets will be required. Include, in the Contract, the following additional installations:
 - Two (2) typical Data/ VoIP outlets
 - One (1) Building Automation System Network Connection outlets
- .2 Each drop with an average of 20m of conduit installed and terminated at the Hub Room will be required. Assume, for bidding purposes, that these can be added at any time during construction including at the end of the construction and in any location as directed on site.

PART - 2 PRODUCTS

2.1 MATERIAL

- .1 Conduits: EMT type, to Section 26 05 33 - Conduits Fastenings and Fittings.
- .2 Junction boxes and pull boxes to Section 26 05 32 - Splitters, Junction and Pull Boxes, Cabinets.
- .3 Outlet boxes, and fittings: to Section 26 05 35 - Outlet Boxes, Conduit Boxes and Fittings.
- .4 Cover plates: to Section 26 27 26 - Wiring Devices.
- .5 Fish wire: polypropylene type

PART - 3 EXECUTION

3.1 INSTALLATION

- .1 Install empty raceway system, including fish wire, outlet boxes, pull boxes, cover plates, conduit, service poles, miscellaneous and positioning material to constitute complete system.
- .2 Verify exact location of outlets to suit furniture layout.
- .3 Fish conduit, clear blockages and outlet and clean out pull boxes at completion of installation. Leave conduit free of water or excess moisture. Install 3 mm (c") polypropylene pull cord continuously from outlet to outlet, through conduit and fasten at each box.

- .4 Conduit bends shall have a bending radius of not less than ten times conduit diameter. Ream out conduits and identify end with green paint.
- .5 Install additional steel pull boxes in such a manner that, throughout entire system, there shall be not more than two 90 degree or equivalent bends or more than 30 m (100') in each run, so that wire or cables may be pulled in or withdrawn with reasonable ease.
- .6 Minimum space requirements in pull boxes, having one conduit each in opposite ends of box, shall be as follows:

Maximum Size of Conduit in Millimetres (Inches)	Size of Box in Millimetres (Inches)			For each Additional Conduit, Increase Width (Millimetres)Inches)
	Width	Length	Depth	
20 mm (¾")	100 mm (4")	300 mm (12")	75 mm (3")	50 mm (2")
25 mm (1")	100 mm (4")	400 mm (16")	75 mm (3")	50 mm (2")
32 mm (1¼")	150 mm (6")	500 mm (20")	75 mm (3")	75 mm (3")
38 mm (1½")	200 mm (8")	675 mm (27")	100 mm (4")	100 mm (4")
50 mm (2")	200 mm (8")	900 mm (3')	100 mm (4")	125 mm (5")

- .7 Minimum space requirements in pull boxes for 90 degree pulls, shall be as follows:

Maximum Size of Conduit in Millimetres (Inches)	Size of Box in Millimetres (Inches)			For each Additional Conduit, Increase Width Millimetres (Inches)
	Width	Length	Depth	
20 mm (¾")	150 mm (6")	300 mm (12")	100 mm (4")	50 mm (2")
25 mm (1")	200 mm (8")	400 mm (16")	150 mm (6")	50 mm (2")
32 mm (1¼")	250 mm (10")	450 mm (18")	200 mm (8")	75 mm (3")
38 mm (1½")	300 mm (12")	600 mm (24")	250 mm (10")	100 mm (4")
50 mm (2")	350 mm (14")	750 mm (30")	300 mm (12")	125 mm (5")

- .8 Maintain separation of communications conduits to sources of electromagnetic interference as follows:

Item	Minimum Clearance
Fluorescent ballasts	150mm (6")
Conduit and cables used for electrical distribution less than 1kV	300mm (12")
Conduit and cables used for electrical distribution greater than 1kV	1000mm (36")
Motor	1200mm (48")
Transformer	1200mm (48")

- .9 The above tables provides a guideline and at all times the Consultant may advise greater clearances if the currents being carried through these devices are particularly likely to cause interference.
- .10 Interference shall be minimized by ensuring that, wherever possible, communications conductors cross sources of interference at right angles.
- .11 Install cables, conduit and cable tray, etc. along or at right angles to building lines unless impractical to do so. Verify specific cases of deviation in advance with consultant.

END OF SECTION

COMMUNICATIONS CABLING

27 15 00

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Comply with General Conditions of Contract, Supplementary Conditions and Division 01 - General Requirements.
- .2 Where conflict occurs between Codes, Specification and Drawings, plan and riser, the maximum condition to govern, and the Tender to be based on whichever indicates the greater cost.
- .3 Conform with the requirements of the Electrical Tender Specifications and Drawings.
- .4 **Refer also to Sunnybrook 'Data Centre and Hub Room Access Policy' Appended to this Specification. Refer also to Sunnybrook 'ICN Cable Installation Standards' Appended to this Specification**

1.2 WORK INCLUDED

- .1 Price quotations are to include the furnishing of all materials, equipment, maintenance and training manuals, tools, and the provision of all labor and services necessary or proper for the completion of the work, except as may be otherwise expressly provided in the Contract Documents. The Owner will not be liable for any costs beyond those proposed herein and awarded.
- .2 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete Communications systems as shown, as specified and as otherwise required. Complete systems shall be left ready for continuous and efficient satisfactory operation. Provide equipment, materials, labor, and services not specifically mentioned or shown which may be necessary to complete or perfect all parts of this installation and in compliance with requirements stated or reasonably inferred by the Contract Documents.
- .3 All work shall be performed as per the schedule prepared by the General Contractor. Allow for work to be done after hours and on weekends as dictated by the schedule.
- .4 **Installations in existing Hospital Network Hub Rooms:**
 - .1 **Access to Sunnybrook Hospital Network Rooms is severely restricted and Contractors will not be allowed to access these rooms un-escorted/ un-supervised. To complete this installation the following applies:**

- **Contractor must retain the Hospital's Security Department to allow access to and supervise activities of the Contractor while in the Hub Room for any Cable/ Equipment installation in the Hub Room (it is assumed Contractor can install Cabling to a point outside of the Hub Room but can not install the Cable into the Hub Room without Security Supervision) and to complete Cable connections and equipment installation (Patch Panels)**
- **Arrangements for Security Supervision is to be coordinated directly between Security and the Contractor with the Contractor providing a minimum seven days written request**
- **The Hospital's Security Department will charge the Contractor \$50.00 (fifty dollars) per hour for a minimum four hours at any one time**

.5 AS THE CONTRACTOR IS RESPONSIBLE TO COVER ANY/ ALL COSTS REQUIRED TO RETAIN THE HOSPITAL'S SECURITY GROUP, IT IS STRONGLY RECOMMEND THE CONTRACTOR PROPERLY SCHEDULE THE NEED TO ACCESS HUB ROOMS AND THAT THE TIMES REQUIRING ACCESS BE ACCURATELY INDICATED ON THE PROJECT SCHEDULE

.6 GENERAL:

.1 "CATEGORY 6 CABLING JACKS"

To clarify all Network Type outlets require 'Category 6 Jacks' and 'Category 6 Cabling'. There is no 'Category 5E' jacks/ cabling on this project.

.2 "FIBRE PATCH CORDS"

All fibre Patch Cords are to be "single mode type". Delete all references to "multimode type patch cords"

1.3 PRE/ POST OCCUPANCY PROVISIONS

- .1** Assuming the Hospital will, as the time for occupancy approaches or even after occupying, resolve that some additional telephone/ data outlets/ monitor/ CCTV/ Security System outlets will be required. Include, in the Contract, the following additional installations:
 - Two (2) typical Data/ VoIP outlets
 - One (1) Building Automation System Network Connection outlets
- .2** Each drop with an average of 90m of cables installed and terminated at the Hub Room will be required. Include cable, patch cords, jacks, face-plates, labels, terminations, testing, and documentation for each drop. Assume, for bidding purposes, that these can be added at any time during construction including at the end of the construction and in any location as directed on site. Devices not installed at the construction completion are to be turned over to the Hospital as spare parts for future installation.

1.4 **INSTALLATION STANDARDS**

- .1 The following are typical outlet types used on this project:
 - Emergency Telephone outlet consisting of a single gang box with one 'RJ-45' voice jack and one 'Cat 3' voice cable in conduit/ wireway system to Telephone backboard
 - Wireless Receiver (WAP) outlet consisting of a single gang in-line 'RJ-45' data jack and one 'Cat 6' cable in conduit/ wireway system to Hub Room. Provide a minimum 25'-0" cable coiled in ceiling space to allow flexible location of the receiver.
 - typical Data/ VoIP outlet consisting of a single gang box with three 'RJ-45' data jacks (two for "data" and one for "VoIP") and three 'Cat 6' data cables in conduit/ wireway system to Hub Room
 - Data/ VoIP/ Printer outlet consisting of a single gang box with three 'RJ-45' data jacks and three 'Cat 6' data cables in conduit to Hub Room
 - Data/ VoIP/ Printer/ Telephone (could be Fax or Conference Phone) outlet consisting of a single gang box with three 'RJ-45' data jacks, one 'RJ-45' voice jack, three 'Cat 6' data cables in conduit/ wireway system to Hub Room and one 'Cat 3' voice cable in conduit/ wireway system to Telephone backboard
 - CCTV to Network outlet consisting of a single gang box with one 'RJ-45' CCTV jack and one 'Cat 6' data cable in conduit to Hub Room
 - Security System to Network outlet consisting of a single gang box with one 'RJ-45' Security System jack and one 'Cat 6' data cable in conduit to Hub Room
 - Smart Board outlet consisting of a single gang box with one 'RJ-45' data jack and one 'Cat 6' data cable in conduit to Hub Room
 - Alarm outlet consisting of a single gang box with one 'RJ-45' Alarm jack and one 'Cat 6' Alarm cable in conduit to Code White System
- .2 All Data, Monitor, TV, CCTV and Security System outlets shall be PS5+ Gigaflex eight (8) position Cat 6 module.
- .3 All cables shall have "**Category 6**", **white coloured**, eight -24 AWG thermoplastic insulated, solid conductors formed into individually twisted pairs and enclosed in a **CMP (FT-6)** rated thermoplastic jacket and all individual conductors to be insulated with fluorinated ethylene propylene (FEP).
- .4 All drops will be routed through conduit system provided and installed by Division 16 Contractor. If conduits are provide for the entire route of the cable, CMR (FT-4) cable can be used.
- .5 Where cable is run through modular furniture all cables must be protected by spiral wrap from the "service" pole to the furniture race way. The Communication Cabling Contractor is responsible to supply and install spiral wrap.
- .6 All cables will be terminated on flush mount outlets as determined by the type of wall or furniture used.
- .7 All Data/ VoIP Cables must have a orange coloured insert, all Voice Cables must have a blue insert, all TV Cables must have yellow insert, all CCTV to Network Cables and all Security to Network Cables must have white inserts.

- .8 All **Data, CCTV to Network and Security System to Network drops** will terminate on 48 port MDVO modular patch panels completely filled with black EZ MDVO PS5 modular jacks in the telecommunications room as noted on drawings. The number of patch panels will be determined by the total number of data ports that the closet must serve plus 20% space capacity for future use.
- .9 All **Voice drops** will terminate on the BIX blocks. The pigtail cable shall connect voice patch panel with the BIX block on the wall. See Drawings for details.
- .10 All **TV drops** will terminate on dedicated TV system 48 port MDVO modular patch panels completely filled with black EZ MDVO PS5 modular jacks in the telecommunications room as noted on drawings. The number of patch panels will be determined by the total number of data ports that the closet must serve plus 20% space capacity for future use.
- .11 All drop locations and quantities to be confirmed prior to the start of the installation.
- .12 "Cabletalk" heavy duty 19" x 84" floor mounted communications racks with two (2) vertical managers shall be used. Two 12-outlet power bars shall be installed on the back of each rack.
- .13 The Racks shall be bolted to the floor. New Racks are required in the new Hub Room. Refer also to Drawing Details.
- .14 Rack mounted vertical cable managers are to be manufactured by Cabletalk, and a minimum of 6" wide with a swing-out door.
- .15 Horizontal rack mount cable managers are to be manufactured by Cabletalk, 2u wide for 19" Communications Racks with a swing-out door. Provide one (1) horizontal cable manager for each patch panel (copper and fibre).
- .16 Telecommunications racks shall be grounded as per the electrical code to the Telecommunications Ground Bar (TGB). #6 AWG green grounding cable shall be used.
- .17 Performance of the cables shall comply with the latest draft of ANSI/EIA/TIA-568A Addendum 5 Attenuation and Power Sum Near End Cross Talk (NEXT) parameters for UTP Category 6 cable.
- .18 For horizontal voice terminations provide spare QCBIX1A4 and QCBIX 1A connectors in any spare or partially filled mount, such that all mounts are completely filled. Use standard BIX single jumper channel layout.
- .19 The fibre optics panels for the incoming fibre backbones shall have a slide out shelf or swing out drawer for access to the fibres. The fibre optics panels shall provide bend radius control and use a strain relief to accommodate the fibre optics cables. Use NORDX FIBEREXPRESS 19" shelf manager with 12 modules. See drawings for details.

- .20 The Fibre Patch cords shall be included in the base bid price. The quantity of the cords is 12duplex SC-SC type 10' M/M, and 4 duplex SC-SC type 10' S/M for each telecommunications closet. Factory assembled only. Site prepared will not be accepted.
- .21 The number of patch panels shall be as required for outlets shown on the floor plans plus 20 % spare capacity which shall be provided for the future applications.
- .22 The communication contractor shall refer to the construction schedule prepared by the General Contractor and include for premium labour costs if required to meet the schedule.
- .23 Horizontal Data and Monitor cabling will be split and dressed down the back and each side of the Rack, terminating on **Beldon 48 port HD Patch panels**.
- .24 For horizontal Data terminations, **provide one spare Patch Panel**. For horizontal voice terminations, **provide one spare QCBIX1A4 connector** in any spare or partially filled mount. Use standard BIX single jumper channel layout.
- .25 The Rack mountable Patch Panels performance shall comply with the latest draft of ANSI/EIA/TIA-568A Attenuation and Power Sum Near End Cross Talk (NEXT) parameters for UTP Category 6 hardware.
- .26 All Patch Cords shall be factory assembled and not site prepared.

1.5 **INSTALLATION REQUIREMENTS, WORKSTATION**

- .1 All Data, Voice, TV, CCTV to Network and Security to Network outlets shall be **Beldon EZ-MDVO RJ45** flush mounted where possible, otherwise a **Beldon** surface mount shall be used unless otherwise indicated on the supplied drawings.
- .2 The number of patch panels shall be as required for the number of cables shown plus the spare specified.

1.6 **INSTALLATION GUIDELINES**

- .1 Codes and Standards
 - .1 All work performed on this project will be installed in accordance with the current edition of the Canadian Electrical Code and all local codes and ordinances, authorities having jurisdiction, and the following standards (including all sub-headings, addenda, and TSBs):
 - ANSI/TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements, 2001.
 - ANSI/TIA/EIA-568-B.2, Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components, 2001.
 - ANSI/TIA/EIA-568-B.3, Optical Fiber Cabling Components Standard, April 2000
 - ANSI/TIA/EIA-569-B, Commercial Building Standards for Telecommunications Pathways and Spaces, 2003.

ANSI/TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure, 2002
ANSI J-STD-607-A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, 2002.
CSA C22.1-02, Canadian Electrical Code, Part 1, 2002.
CSA T527, Grounding and Bonding for Telecommunications in Commercial Buildings, 1999.
CAN/CSA T528, Design Guidelines for Administration of Telecommunications Infrastructure in Commercial Buildings, 1997.
CSA T529, Telecommunications Cabling Systems in Commercial Buildings, 2000
CSA T530, Commercial Build Standard for Telecommunications Pathways and Spaces, 1999
Building Industry Consulting Service International (BICSI) TDM Manual latest editions at the time of tender
Manufacturers design guide

- .2 The Contractor's performance of the work shall comply with applicable national, provincial and local laws, rules, and regulations. The Contractor shall give required notices, shall procure necessary governmental licenses and inspections, and shall pay without burden to the Owner, all fees and charges in connection therewith unless specifically provided otherwise. In the event of violation, The Contractor shall pay all fines and penalties, including attorney's fees, and other defense costs and expenses in connection therewith.

1.7 **QUALIFICATION OF SYSTEM**

- .1 **General**
- .1 Acceptable proposed system will be covered by a two part certification program provided by the single manufacturer and that manufacturer's Reseller (Vendor, Installer or similar designation).
- .2 Manufacturer shall administer a program through the Installer to provide support and service to the purchaser.
- .3 The first part is an assurance program which provides that the certified system will support the applications for which it is designed, during the lifetime of the certified system.
- .4 The second portion of the certification is a 25-year warranty provided by the Manufacturer and the Reseller on all products within the system (jacks, cables, cross-connects, baluns, etc.).
- .5 In the event that the certified system ceases to support the certified applications, whether at the time of cut over, during normal use or when upgrading, the Manufacturer and Reseller shall commit to promptly implement corrective action.
- .6 Documentation proving the cabling system's compliance to the recommendations, as listed in the Codes and Standards section shall be provided by the Reseller prior to the structured cabling system being installed.

- .7 Workmanship and installation methods used shall be equal to or better than that found in the BICSI (Building Industry Consulting Service International) TDM manual and the NeiS document "Installing Commercial Building Telecommunications Cabling".
- .8 Purchaser demands strict adherence to the performance specifications listed in the Codes and Standards section. The manufacturer shall maintain 9001 Quality Control certification for the facilities that manufacturer the product used in this cabling system.

PART - 2 MANUFACTURER

2.1 GENERAL

- .1 Manufacturer refers to the company that manufactures the components and is responsible for the design and installation guidelines used by the Reseller (Installer, Vendor, or similar designation) to complete this cabling system installation.
- .2 The manufacturer along with the Reseller is responsible for the final warranty and certification of the application assurance.
- .3 The Reseller shall show proof of a contractual relationship with the Manufacturer, and shall pass through the Manufacturer's certification to purchaser.
- .4 The cabling manufacturer shall provide an end-to-end cabling solution, including horizontal cables, backbone cables, jacks and connectors, patch panels, termination blocks, patch cords and jumpers. For this project only end-to-end solutions shall be accepted.
- .5 Where no manufacture is specified, provide products from manufactures in compliance with the listed requirements.

2.2 SUBMITTALS

- .1 Pre-construction Submittals
- .2 Submit the following documents for Review prior to construction:
 - .1 A cable labelling schedule (see Administration Section for more information)
 - .2 Cross-connect schedule for approval by the Owner.
 - .3 A list of all staff to be used, including proof of experience of installing structured cabling.
 - .4 Shop drawings:
 - .1 Submit shop drawings, product data, and samples with promptness as not to cause delay in work or in the activities of separate contractors. Submit shop

- drawings, product data, and samples as a complete set within thirty (30) days of award of contract for Engineer's Review.
- .2 By submitting shop drawings the Contractor represents that the materials have been carefully reviewed and verified, as well as related quantities, field measurements, and field construction criteria. It also represents that the Contractor has checked, coordinated, and verified that information contained within shop drawings and samples conform to the requirements of the contract documents.
 - .3 The Review of shop drawings, product data, and samples submitted by the Contractor shall not relieve the Contractor of responsibility for deviations from requirements of the contract documents, unless the contractor has specifically informed the Engineer in writing of such deviation at time of submittal, and the Engineer has given written approval of the specific deviation. The Contractor shall continue to be responsible for deviations from requirements of the contract documents not specifically noted by the Contractor in writing, and specifically approved by the Engineer in writing.
 - .4 The Engineer's Review of shop drawings, product data, and samples shall not relieve the contractor of responsibility for errors or omissions in such shop drawings, product data, and samples.
 - .5 The Engineer's Review of shop drawings, product data, and samples, is for the limited purpose of checking for conformance with information given and design concept expressed in the contract documents. The Engineer's Review of such submittals is not conducted for the purpose of determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the contractor as required by the contract documents. The Review shall not constitute approval of safety precautions or of construction means, methods, techniques, sequences, or procedures. The Engineer's Review of a specific item shall not indicate approval of an assembly of which the item is a component.
 - .6 Perform no portion of the work requiring submittal and review until the Engineer has Reviewed the respective submittal.
 - .7 Submit two (2) copies of each shop drawing for Review. One (1) copy shall be retained by the Engineer. All other copies shall be returned.
- .5 Post-construction Submittals (Maintenance Manuals)
 - .6 The Contractor shall submit within two (2) weeks of the end of construction:
 - .1 Manufacturer's technical documentation on all devices used in cabling system.
 - .2 Manufacturer supplied Application Guidelines for required applications.

- .3 The Manufacturer's and Contractors Warranty and Certification
- .4 Complete cable testing documentation in hard and soft copies. Provide licenced versions of any software required for viewing test results.
- .5 An End User's Manual describing the essential system elements as well as the end user's responsibility for maintaining the integrity of the cabling system over time. This Manual shall include, as a minimum, guidelines for system expansion and modification (moves, additions, changes of service) as well as labelling and record keeping.
- .6 The project shall not be considered complete until all documents, including the original Manufacturer's Certification, have been delivered to the Owner.
- .7 Within 30 days prior to substantial completion, the Contractor shall submit a draft copy of the proposed contents of each manual to the Consultant for review prior to substantial completion. Within 10 days the Consultant shall provide a review of this document to the Contractor.
- .8 Once the draft copy is approved, the Contractor will supply four (4) copies in suitably labelled, hard back, D-Ring type commercial binders, each complete with an index and tabbed title sheets for each section. Final copies of manuals are to be received by Consultant not less than 7 days prior to substantial completion.

2.3 AS-BUILT DRAWINGS

- .1 The Contractor shall keep one complete set of prints at the site office, including all addenda, change orders, site instructions, clarifications and revisions for the purpose of record drawings. As the work on site proceeds, the Contractor shall clearly record in Red Pencil all as-built conditions that deviate from the original contract documents.
- .2 Within two (2) weeks of the Project's completion the Contractor shall submit a complete set of As-Built drawings including cable routing, Telecommunication Rooms layouts, riser diagrams and telecommunications outlets. The layout shall detail locations of all equipment and indicate all wiring pathways, and outlets (including cable ID numbers). This as-built information shall include Addenda, Change Orders, Clarifications, Revisions, and Site Instructions.
- .3 Upon completion the Contractor shall certify, in writing that the as built records are complete and that they accurately indicate all communication services related to the communications infrastructure. This shall include all visible and all invisible items. The information shall also correspond with all identifications applied by the Contractor to cables and termination devices in the buildings.

- .4 The Contractor shall forward a letter of certification to the Consultant for final review and as-built CAD drawings to the Consultant for final review.
- .5 The contractor may obtain copies of the telecommunication contract drawings (Tender Issue) in dwg format from the Consultant on request. A drawings release form needs to be signed by the Contractor prior to releasing the drawings.
- .6 After as-built drawings have been reviewed, print four (4) full size copies of the drawings. Deliver two (2) copies to the Owner and two (2) copies to the Facilities Management (if different from the Owner).

PART - 3 COMMUNICATIONS CONTRACTOR

3.1 PROJECT MANAGER

- .1 Within ten (10) days of the date of acceptance of this Bid, the Contractor shall notify the Consultant of the appointment of a competent Project Manager, experienced in the design and installation of structured cabling systems and in the supervision of similar contract work.
- .2 The Project Manager shall be available during the entire life of the Contract to answer all questions pertaining to the contractual work, and shall be available at the site from the commencement date of equipment delivery to the commissioning completion date.
- .3 The Project Manager shall represent the Contractor and shall have authority to carry out directions given to him as the Contractor's representative.

3.2 COMMUNICATIONS INSTALLERS

- .1 The staff selected for the installation of the structured cabling system shall conform to the following:
 - .1 An installer on site that is a current member of BICSI and holds a valid RCDD designation. This installer along with the Project Manager will ultimately be responsible for the construction of this project.
 - .2 The Contractor must also have BICSI Registered Installers and Technicians on staff and assign them to this project. The project shall be staffed at all times by Installers and Technicians who, in the role of lead craftspersons, will be able to provide leadership and technical resources for the remaining craftspersons on the project.

- .3 Submit to the Consultant within seven days of Contract Award a list of all staff to be used in above installation including proof of experience.
- .4 ONLY qualified technicians directly employed by the CSV or Reseller shall terminate all cables (at both ends), test and perform cross-connects.
- .5 Certification in the installation of structured cabling system under the title of CSV, Reseller, Vendor, or other similar status issued by the cabling manufacturer.
- .6 Provide Manufacturer's Certification Number within two weeks upon award of contract.
- .7 If, in the opinion of the Owner, the RCDD does not possess adequate qualifications to support the project, the Owner reserves the right to require the Contractor to assign an RCDD who, in the Owner's opinion, possesses the necessary skills and experience required of this project.

PART - 4 INSTALLATION GENERAL REQUIREMENTS

4.1 GENERAL REQUIREMENTS

- .1 All voice and data outlets shall be flush mounted where possible; otherwise a surface mount shall be used unless otherwise indicated on the supplied drawings.
- .2 All face plates shall be coloured to match electrical face plates in the area unless otherwise noted.
- .3 Blank inserts are to be placed in to outlet ports not containing communications jacks. The blanks are to be coloured to match the faceplate.
- .4 All four pairs of horizontal cables are to be terminated. ISDN T568A wiring configuration is to be used. The splitting of pairs is strictly prohibited.
- .5 All drop locations and quantities to be confirmed prior to the start of the installation. Allow a variation of 4.5m (15').
- .6 Horizontal cabling will be split and dressed on ply-wood backboards and rack. Distribute cables evenly and neatly in bundles.
- .7 The length of each individual run of horizontal cable from the patch panel on each floor to the telecommunications outlet shall not exceed 90m (295').
- .8 All cables shall be loosely bundled using Velcro cable ties every 150mm (6"). To minimize the effects of alien cross-talk, do not comb-out cables.
- .9 Utilize all indicated and available cable pathways such as conduit, cabletrays, ducts, raceways and furniture system channels except where otherwise noted. Exercise caution when pulling cables in such pathways to avoid damage to any cabling and to ensure that

the cable manufacturers' maximum pull-force and minimum bend radii specifications are adhered to.

- .10 All free running cables shall be securely fastened to appropriate cable supports so that cables routed to the under side of the floor tiles with a maximal inter-harness cable sag of 150mm (6"). All cables shall be completely supported by the harness so that the entire mass of the cables and harnesses are self supporting and no weight is transferred to any other existing fixture or structure in the ceiling space. The Contractor shall be responsible for the supply of all materials (such as hangers, harnesses or supports) and labour that may be required to achieve this.
- .11 Route all cables to maintain minimum separations from sources of lighting, power cables, HVAC and electrical equipment as indicated in the Manufacturer's minimum separation schedule or otherwise required. The Contractor shall be responsible for the supply of all materials (such as hangars, harnesses or supports) and labour that may be required to maintain the indicated minimum separations.
- .12 In the Telecommunications Rooms all communications cables shall be neatly bundled, supported and routed to the corresponding termination panel. The Contractor shall be responsible for the supply and installation of any additional cable supports. Velcro tie-wraps on cables should be loose and rotate freely.
- .13 Each run of cable between the termination block and the data outlet shall be continuous without any joints or splices.
- .14 Where the Contractor is required to remove ceiling tiles, such work shall not break or disturb grid or tiles.
- .15 Terminated conductor ends shall be properly trimmed to assure a minimum clearance of 0.250" between the conductors of adjacent modules.
- .16 Ground all Telecommunications equipment, racks and cabletrays using green insulated #6 AWG copper wire to the Telecommunications Ground Bar. All ground wires shall be home-run back to the Telecommunications Ground Bar. Do not daisy chain.
- .17 Completely test out systems and, before they are turned over to Owner, demonstrate them to Owner's representative until such time as he is fully conversant with the operation of the systems.
- .18 Six months after installation has been accepted by Owner, arrange a time convenient to the Owner to do necessary re-aligning, and replace defective components.

4.2 **COMMUNICATIONS HORIZONTAL CABLING**

- .1 General
 - .1 All horizontal cables will be FT6 rated for plenum environment (CMP).
 - .2 All terminations shall be in T568A configuration.

- .3 For all horizontal cables provide 3m of slack at the cabinet end and 1m of cable slack at the workstation end.
- .4 Follow the Manufacturer's guidelines for pulling force. If no guidelines are present the maximum pull-force for 4-pair horizontal twisted-pair cables is 111N (25 lbf).
- .5 Maintain the manufacturer's recommended bend radius at all times. If no guidelines are present ensure the bend radius does not exceed four (4) times the outside cable diameter.
- .6 The communications wiring system shall be an end-to-end solution provided by a single manufacturer.
- .7 Cables will be routed through conduits, cabletray. The Division 26 Contractor will provide the conduits and cabletray where shown.
- .8 Approved manufactures for the end-to-end cabling solution are as follows:

Standard of Acceptance
Belden/CDT (To match existing facility standard)

- .2 Horizontal Data Cables
 1. Provide horizontal cables to connect each information outlet to the backbone subsystem on the same floor.
 2. All horizontal cabling shall be **BELDON Category 6, IBDN for FT-6** environment. All Category 6 cables shall conform to or exceed the EIA/TIA 568 Commercial Building Wiring Standard. Horizontal Cable Section and the EIA/TIA Technical Systems Bulletin 36 for Unshielded Twisted Pair Cables. Other standards supported include IEEE 802.3, 1Base5, 10BASE-T; IEEE 802.5, 4 Mbps, 16Mbps (328 ft [100m], 104 Workstations) and proposed ANSI X3T9.5 TTPMD requirements for UTP at 100 Mbps. In addition, cables shall be capable of supporting evolving high-end applications such as 155 Mbps ATM.
 3. The 4 pair UTP cable shall be UL Listed type CM. or CMP.
 4. All plenum rated Category 6 Unshielded Twisted Pair (UTP) cables shall be composed of 24 AWG solid copper conductors, dual insulated with high density polyethylene (HDPE). The insulated conductors are twisted into pairs and jacketed with Polyvinyl Chloride (PVC) and shall meet or exceed the Electrical Specifications listed below:
 1. Maximum DC resistance 28.6 S/1,000 ft (9.38S/100m) Maximum DC resistance
 2. Unbalance: 5% Mutual Capacitance @1kHz: 14nF/1,000 f
 3. Mutual Capacitance Unbalance (pair to ground): 40OpF/1,000 ft (131.2 pF/100m)
 4. Attenuation (dB/1,000 ft [305m]): @ 0.772 MHz: 5.5@ 1.0 MHz: 6.3@ 4.0 MHz: 13@ 8.0 MHz: 18@ 10.0 MHz: 20@ 16.0 MHz: 25@ 20.0

MHz: 28@ 25.0 MHz: 32@ 31.25 MHz: 36@ 62.5 MHz: 52@ 100 MHz: 67

5. Characteristic Impedance (S):@ 0.064 MHz: 125 ± 15S@ 0.128 MHz: 115 ± 15S@ 0.256 MHz: 110 ± 15S@ 0.772 MHz: 105 ± 15S@ 1.0-25.0 MHz: 100 ± 15S

6. Pair to Pair Next (db) at 1,000 ft (305 m):

FREQUENCY	EIA STANDARD	90 TH PERCENTILE
1.0 MHZ	62	68
4.0 MHZ	53	59
8.0 MHZ	48	54
10.0 MHZ	47	53
16.0 MHZ	44	50
20.0 MHZ	42	48
25.0 MHZ	41	47
31.25 MHZ	40	46
62.50 MHZ	35	41
100.0 MHZ	32	38

7. UL Listed

8. CSA Certified

5. The UTP-based cabling system shall be capable of supporting the following applications:
 6. 1.2 Gbps ATM*
 7. Gigabit Ethernet (1000BASE-T)
 8. Broadband Video
 9. 25/52/155/622 Mbps ATM
 10. Fast Ethernet (100BASE-TX, 100BASE-T4)
 11. 100VG-AnyLAN
 12. TP-PMD
 13. Ethernet (10BASE-T)
 14. 4/16 Mbps Token-Ring

15. Baseband Video
 16. ARCnet/ARCnet Plus
 17. IBM System 370/3270
 18. IBM 3x - AS/400
 19. IBM 4700 Financial Communication System
 20. IBM 5080/6090 Graphics System
 21. EIA-232/EIA-422
 22. Voice
- .3 Information Outlet (eight (8) position Category 6 modular jacks at working station. Unless otherwise noted all information outlets shall be:
- 1 Eight (8) position Cat 6 modular type
 - 2 insulation displacement
 - 3 modular
 - 4 universal application/multi vendor supportive
 - 5 accepting most phone and data plugs. Provide corresponding faceplate 4. All Category 6 outlets shall be:
 - 1 The outlet UTP connection module shall be Power Sum rated, with a Power Sum NEXT performance equal to or better than ANSI/TIA/EIA-568 Category 6 pair-to-pair NEXT performance specifications, and shall have a PS5 marking to indicate compliance.
 - 2 The eight-position outlet UTP connection module shall accommodate sixposition modular plug modular cords without damage to either the cord or the module.
 - 3 The outlet UTP connection module shall use a hand-termination installation method, without the need for punch down tools or slip lock pliers.
 - 4 The outlet UTP connection module shall have an optional cover to protect the module when not in use.
 - 5 The outlet UTP connection module and its optional cover shall be available in the following colours: grey, almond, white, black, orange, red, yellow, green, blue, purple, and brown.
 - .6 The outlet UTP connection module shall be designed for use at the Work Area, Telecommunications Closet and/or Equipment Room without modification.
 - .7 The outlet UTP connection module shall only have a single insulation displacement connection block for the termination of wire pairs.
 - .8 The outlet UTP connection module shall be available in both the T568A-ISDN and T568B-ALT wiring configurations.
 - .9 The outlet UTP connection module shall be UL Listed and CSA Certified.
 - .10 The outlet UTP connection module shall be made of fire-retardant UL 94V-0 plastic.
 - .11 The outlet UTP connection module shall have an insulation displacement connection featuring insulation-slicing, tin-plated clips, forming a gas-tight connection.

- .12 The outlet UTP connection module shall have a maximum Contact Resistance of 1 milliohm per contact.
- .13 The outlet UTP connection module shall have an minimum Insulation Resistance of 100 megaohms between clips.
- .14 The outlet UTP connection module shall have a durability rating of 200 insertions/withdrawals of any combination of 24 and 26 AWG wire.
- .15 The outlet UTP connection module modular jack shall be FCC Part 68, Subpart F compliant.
- .16 The outlet UTP connection module modular jack durability shall be 1500 mating cycles.
- .17 The outlet UTP connection module modular jack contact material shall be nickel with 50 micro-inches gold plated.
- .18 The outlet UTP connection module modular jack maximum Current Rating shall be 1.5 amperes.
- .19 The outlet UTP connection module modular jack Dielectric Strength shall be 1000V RMS at 60 Hz for 1 minute.
- .20 The outlet UTP connection module modular jack minimum Insulation Resistance shall be 500 megaohms.
- .21 Outlet Faceplate:
 - 1. The faceplate housing the outlet UTP connection modules shall provide a symmetrically-centered appearance for the modules.
 - 2. The faceplate housing the outlet UTP connection modules shall have no visible mounting screws.
 - 3. The faceplate housing the outlet UTP connection modules shall be removable without requiring the removal of screws or other fasteners.
 - 4. The faceplate housing the outlet UTP connection modules shall have an outlet wiring diagram stamped on the inside.
 - 5. It shall be possible to inspect and/or reterminate the UTP cable at the outlet through front access at the faceplate.
 - 6. The faceplate housing the outlet UTP connection modules shall have aperture plugs to cover any unused openings in the faceplate.
 - 7. It shall be possible to install the outlet UTP connection modules in wall mounted single and dual-gang electrical boxes, utility poles and modular furniture (cubicle) access points using manufacturer-supplied faceplates and/or adapters, equipped with front, side or angled-entry options for modular cords.
 - 8. The faceplate housing the outlet UTP connection modules shall be available in the following colors: grey, almond, white, and black.
- .22 Outlets shall be wired in an EIA/TIA 568 A configuration.
- .23 Unless otherwise noted on the floor plans, the information outlet shall be surface flush mounted, single or multi jacks as indicated.
- .24 Each work area shall be supplied with a telecommunications outlet/connector (previously called a modular jack) for connection to the

horizontal media. All telecommunications outlet/connectors shall be installed in an appropriate faceplate. All telecommunications outlet/connectors shall be complete with faceplate and attached permanently to a fixed structure, such as building walls, utility poles or modular furniture partitions.

- .25 The work area telecommunications outlet/connector must provide maximum flexibility in supporting UTP, fibre, and coax while maintaining performance in order to meet the changing requirements that are likely to occur throughout the life of the system.
- .26 8 Position modular telecommunications outlet/connectors shall accept 8 position modular plugs while providing proper electrical connection and not damaging telecommunications outlet/connector (jack). Manufacturer shall warrant all 8 position modular outlets used in such a manner to be usable for 8 position modular plugs in the future.
- .27 In order to allow normal expansion of service during the life of the cabling system, flush work area telecommunications outlets shall provide sufficient density to support up to a maximum of eight connectors per single gang telecommunications outlet and twelve connectors per double gang telecommunications outlet.

2 **BACKBONE SUBSYSTEM**

- .1 Multi-strand 50/125:µm Multi-mode fibre run between the existing Network Rooms as shown on the plans and the new Telecommunications Room. Terminations shall be on NORDX FIBEREXPRESS 19" fibre patch panels, 2u, complete with 4x 3 SC-duplex Universal Connector Modules. Multimode SC fibre pigtailed are to be fusion spliced for termination. Install one patch panel in each telecommunications closet and four (4) in the POP room. See drawings for details.
- .2 Optical fibre cable to be as follows:
 - 1 The fibre cable shall be enclosed in a CSA , FT4 rated overall jacket. The all fibre runs shall be installed inside orange inner-duct tube for additional physical protection or inside empty conduit provided by electrical contractor.
 - 2 Attenuation shall be measured in accordance with EIA optical fibre test procedure EIA/TIA-456-46, -61, OR-53 (Ref B1.39). Information transmission capacity shall be measured in accordance with EIA/TIA-455-51, or -30 (Ref B1.39).
 - 3 The fibre cable shall meet the NEC requirements for OFNR or OFNP and comply with Bellcore. FDDI. GIGABIT ETHERNET, EIA/TIA-568 and ICEA standards.
 - 4 The optical fibre shall be multimode and single mode optical fibre with a nominal 62.5/125 [9/125] micron core/cladding diameter. The fibre shall comply with ANSI/EIA/TIA-592AAA (Ref B1B) and also with ANSI/TIA/EIA 568A (future CAN/CSA-T529) on Mechanical Terminations.
 - 5 Multi-mode backbone optical fibre cables should be of all dielectric construction and with the following characteristics:

Multi-mode Fibre Cable	850:m	1300:m
Attenuation - dB/km	3.75	1.5
Minimum Bandwidth - Mhz.km	3500	500

6 Each fibre shall be buffered with colour-coded PVC. The fibre cable shall meet the following specifications:

1 Fibre Dimensions:

Multi-mode Optics Cable	Fibre	50m – core
	1	25:m. – cladding
	2	50mm – coating
		900:m – buffering

.2 Cable Minimum Bending Radius:

During Installation: 15 times cable diameter (Short term load).	
Multi-mode Fibre Optics Cable	7.9" (20.1 cm)
After Installation: 10 times cable diameter (long term no load).	
Multi-mode Fibre Optics Cable	5.3" (13.4cm)

- .3 Buffered Fibre Minimum Bend Radius: .75 in. (1.91 cm)
- .4 Operating Temperature Range: -20°C to 70°C
- .5 Storage Temperature Range: -40°C to 80°C
- .6 Numerical Aperture: 0.275

- .7 UL Listed
- .8 The optical cable shall be fully dielectric, with no metallic elements in the cable.
- .9 The optical cable shall have decreasing sequential print on cable jacket of remaining cable length.
- .10 The optical cable shall have a crush resistance of 2000 N/cm.
- .11 The optical cable shall have an impact resistance of 2000 impacts with 1.6 N/m.
- .12 The optical cable shall have a minimum Flexure rating of 2000 cycles.

- .13 All Data Fibre Optic Distribution Panels shall be complete with Rack Mountable Fibre Optic Distribution Centre complete with the following:
 - .1 Cabinet to accommodate up to 6 x 12 fibre connectors and minimum of two separate tight buffered cables.
 - .2 Spools for storing patch cord slack and mechanism to control bend radius of fibres within cabinet.
 - .3 Hinged front or shelf providing easy accessibility to connectors and splices.
 - .4 12 Connector Panel Modules each with 6 LC-compatible interconnection sleeves. See drawings for details.

- .3 For a multi mode, 50/125:µm fibre optics cable factory made pigtail cables to be “fusion method” spliced in the field and used. All connectors shall have the following minimum performance specification:

Parameter	Specification
Max. Attenuation	0.3 dB
Typical Attenuation	= <0.2 dB
Connector Durability	<0.2 dB increase/1000 matings
Reflectance (Db)	-20

4.3. ADMINISTRATION SUBSYSTEM

1. The Administration Subsystem links all of the subsystems together. It consists of labelling hardware for providing circuit identification and jumper wire used for creating circuit connections at the cross connects.
2. The administration subsystem shall consist of wiring blocks for termination of copper cables and fibre patch panels for the termination of optical fibres. All rack layouts to be approved prior to installation.

3. **EQUIPMENT RACKS**

- .1 The 19" equipment racks shall be supplied and installed in the new Hub Room. The Racks shall be manufactured by "Cabletalk" or approved manufacturer.
- .2 The Two Vertical managers shall be provided for each section of the rack. (Cabletalk CTR-CMS series) For two racks a horizontal wiring manager on the top of the racks shall be provided (Cabletalk CTR-CMS-2M)
- .3 Provide two power bars with 12 outlets each, mounted on 6" spacers in the back of the racks.
 - .1 The on/off switch on the power bars shall be factory disabled.
 - .2 The Rack shall be provided with two full size fold-up tray for Cable-talk rack.
 - .3 The racks usable space height shall be 80"
 - .4 The Racks shall be "Cabletalk" CRT-1984 or approved manufacturer
- .5 The XLBET NORDX/CDT QPBIX24A BIX Frame shall be provided for termination of cables inside point of Presence Room.
 - .6 The frame shall be provided with BIX mounts and blocks for termination of 4000 pairs of voice cables.
 - .7 The frame shall include a BIX frame end kit.

1.4 **PATCH PANELS**

1. The termination block shall support the appropriate 'Category 6' applications and facilitate cross-connection and inter-connection using cross connect wire. The UTP cross-connect/interconnect system rack mount shall feature built-in wire management to secure cable bundles, control and maintain proper cable bend radius and provide physical protection for terminations..
2. Patch panel installations shall contain a retaining trough between every 50 pair termination block.
3. The wiring block shall be able to accommodate 24 AWG cable conductors.
4. Termination blocks that require rotation after connection of horizontal/vertical wiring will not be allowed.
5. The block shall be Underwriter's Laboratories (UL) listed.
6. All 'Category 6' Patch Panels shall support 100 Mbps TP-PMD and 155 Mbps ATM and shall meet or exceed the NEXT Values listed as follows: 1.0 MHz: 86@ 4.0 MHz: 74@ 8.0

MHz: 68@ 10.0 MHz: 66@ 16.0 MHz: 62@ 20.0 Mhz: 60@ 25.0 MHz: 58@ 31.25 MHz:
56@ 62.50 MHz: 50@ 100.0 MHz: 46

7. Horizontal cabling will be split and dressed down the back and each side of rack 2, terminating on NORDX 48 port HD Patch panels.

8. The termination block shall support the appropriate Category 6 applications and facilitate cross-connection and inter-connection using cross connect wire. The UTP cross-connect/interconnect system rack mount shall feature built-in wire management to secure cable bundles, control and maintain proper cable bend radius and provide physical protection for terminations.
9. The wiring block shall be able to accommodate 24 AWG cable conductors.
10. Termination blocks that require rotation after connection of horizontal/vertical wiring will not be allowed.
11. The block shall be Underwriter's Laboratories (UL) listed.
12. Contractor shall supply cross-connect wire and patch cords for cross-connection and inter-connection of termination blocks and fibre optics termination units.
13. One patch cord shall be provided for each workstation outlet, and one for each data port in the telecommunications closet.
14. The type of jumper cables shall depend on EIA/TIA Category 6 applications and the termination block used. i.e. a punch panel, a patch panel termination block.
15. The UTP data patch cord for connecting a computer workstation to its corresponding equipment jack shall be manufactured by NORDX.
16. The UTP data patch cord lengths shall be as follows: 10 ft
17. The Data Backbone Duplex Optical Fibre Patch Cords shall be comprised of dual multimode 50/125 um graded index, dual window fibres terminated on all ends with ceramic LC compatible connectors.
18. The Plus series patch cord shall be available in 4 pair version with lengths of 10 feet and shall meet or exceed the following electrical, mechanical and NEXT specifications listed below:
19. The modular plug shall meet the requirements of the latest issue of ANSI/TIA/EIA-568.
 - a. The modular plug shall meet the requirements of the latest issue of ISO/IEC 11801.
 - b. The modular plug shall meet the requirements of the latest issue of FCC Part 68, Subpart 5.
 - c. The modular plug shall meet the requirements of the latest issue of IEC 603-7
 - d. The modular plug shall have a maximum Voltage Rating of 150V AC.
 - e. The modular plug shall have a minimum Dielectric Withstanding Voltage of 1000V RMS at 60 Hz for 1 minute.
 - f. The modular plug minimum insulation resistance shall be 500 megaohms.
 - g. The modular plug maximum contact resistance shall be 10 milliohms.
 - h. The modular plug housing shall be made of UL 94V-0 rated polycarbonate.
 - i. The modular plug contacts shall be made of phosphor bronze.

- j. The modular plug contacts shall be plated with a minimum of 50 microinches of gold.
 - k. Each modular plug of every modular cord shall be legibly and indelibly stamped with the wiring configuration of the cord (T568A or T568B).
 - l. The modular plug shall be crimped such that the distance between the top of each contact and the bottom of the plug is 0.237 +/- 0.005 inch. The insulated conductor shall be visible from the front of the plug.
 - m. The modular plug shall be UL 94V-0 Flame Rating compliant.
20. Plus Series Modular Cord Assembly:
- a. The modular cord assembly shall meet or exceed the short link NEXT requirements of 34 dB when tested with enhanced Category 5 connecting hardware.
 - b. The modular cord assembly shall meet the requirements per the latest issue of ANSI/TIA/EIA-568
 - c. The modular cord assembly shall meet the requirements per the latest issue of ISO/IEC 11801
 - d. The modular cord assembly shall be UL listed as a Communication Cable Assembly.
 - e. The modular cord assembly shall be CSA Certified as a Communication Cord Set.
 - f. The modular cord assembly shall be capable of withstanding an 11.25 pound pull test. Each of the individual conductors shall be capable of withstanding a 3 pound pull.
 - g. Each conductor in every modular cord assembly shall be capable of withstanding, without breakdown for 1 minute, an AC (RMS) potential of 1000V (1500V DC). Each conductor shall be tested against all other conductors and/or any metal enclosure part of a connector, all electrically connected together and grounded. The test voltage shall be increased from zero at a rate not exceeding 200 V/s until the required value has been attained.
21. The patch cord shall have built-in exclusion features to prevent accidental polarity reversals and split pairs.
22. The panels shall accommodate LC type adapter sleeves. Rack mounted fibre patch panels shall be lockable & rugged enclosures that can accommodate both splices and field mountable connectors. Both sides of the connection shall be protected by the enclosures
23. The optical fibre distribution terminal with the highest density of fibre terminations while maintaining a high level of manageability shall be selected.
24. The fibre cladding shall be covered by aramid yam and a Jacket of flame-retardant PVC.

25. The fibre patch cord shall meet the following specifications:
 - a. minimum bend radius: 1.00 inch (2.54 cm)
 - b. operating temperature: -4 to 158° (-20° to 70°)
 - c. loss: 0.4 Db/mated connector
 - d. minimum bandwidth: 3500MHz-km at 850 nm
 - e. 500MHz-km at 1300 nm
26. The Fibre patch panels shall provide cross-connect, inter-connect, splicing capabilities and contain the proper troughs for supporting and routing the fibre cables/jumpers.
27. Fibre Panels should provide for a flexibility point for cross connection or inter connection of optical fibre cables for in-building applications.
28. The panels should accommodate LC type adapter sleeves. They should be rugged and provide for strain relief for fibre connections.
29. The patch/distribution panels should be adaptable to 19" wide equipment racks or allow for wall mounting where indicated.
30. The panels should also accommodate storage and management of at least two metres of slack per fibre.
31. The panels should provide for grounding (where non dielectric cables are used).
32. Fibre Connections can be made with fibre splices (fusion) and pigtails. Connectors are the LC type according to the TIA/EI!-568-B.
33. Fibre patch cords shall be equipped with appropriate connectors. They shall use either single or dual fibre cables. Buffered fibre overlaid with strength material, such as kevlar, and a second PVC jacket shall be used. The maximum loss values shall not exceed the manufacturer specified values.
 - a. Splice (mechanical/fusion) 0.30 dB
 - b. Connector (mated pair) 0.75 dB
 - c. Cross-Connect (two mated pairs) 1.5 dB
34. The length of cords shall be 10' for each telecommunication closet.
35. The Fibre patch panels shall consist of a modular enclosure with retainer rings in the slack storage section to limit the bending radius of fibres.
36. The fibre patch panels shall have a "window" section to insert connector panels for mounting of connected fibres (LC connectors).
37. LC connectors shall meet or exceed the following specifications:
 1. Operating Temperature: -40 to 185 degree F (40 to 85 degree C)
 2. Average Loss: 0.3 dB

4.5 COMMUNICATIONS CONNECTING CORDS, DEVICES AND ADAPTERS

- i. Data Patch Cords

1. For each data drop installed provide one (1) patch cord at the patch panel end. Provide quantities as follows:
 - a. 100% Category 6 patch cords (RJ45-RJ45), 1.2m (4') in length
2. For each data drop installed provide one (1) patch cord at the workstation end. Provide quantities as follows:
 - a. 100% Category 6 patch cords (RJ45-RJ45), 2.1m (7') in length
3. All data patch cords shall be installed by the Contractor.
4. All data patch cords shall be RJ45 to RJ45 with booted connector ends.
5. All patch cords shall be FT6 rated.

1.6 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

.1 General

- .1 The Administration Subsystem links all of the subsystems together. It consists of labelling hardware for providing identification.
- .2 Administration shall be in compliance with the TIA/EIA-606-A standard for Class 2 Administration. Identifiers are required in the following locations:
 - (a) Security Server Room
 - (b) Intra-building backbone cable
 - (c) Horizontal link
 - (d) Cabinets
 - (e) Patch panels
 - (f) TMGB
 - (g) TGB
- .3 The Owner may deviate from the TIA/EIA-606-A standard to suit their own particular administration system.
- .4 Submit a complete labelling schedule (as noted in the per-construction submits section) to the Owner for review. Allow for the Owner to make changes.
- .5 The Contractor shall provide labels at the following locations:
 - (a) At each end of the cable jacket within 6" of where the jacket has been stripped.
 - (b) On the front of each faceplate
 - (c) On the inside of each outlet box
 - (d) On the front of the patch panel or termination block
 - (e) At each end of each patch cord and pigtail cable within 50mm (2") of the connector
- .6 Labels shall be machine printed with black text on white backing.
- .7 The minimum height of text shall be 3/16".
- .8 Use labels produced by the cabling manufacturer as recommended for the application.
- .9 For labels on racks, cabinets, and patch panels supply lamicoide name plates. Colours shall be black text on white backing.

.2 Numerical Identification

- .1 Label Telecommunication Rooms as follows:

- (a) FS
 - (b) F = floor the Telecommunications Room is located
 - (c) S = unique identifier for the Telecommunications Room on that floor (A, B, C...)
- .2 Label all horizontal data links as follows:
- (a) FS-DXXX
 - (b) FS = the Telecommunications Room identifier for the room the cable is terminated
 - (c) D = Data
 - (d) XXX = unique cable number
- .3 Label all horizontal voice links as follows:
- (a) FS-VXXX
 - (b) FS = the Telecommunications Room identifier for the room the cable is terminated
 - (c) V = Voice
 - (d) XXX = unique cable number
- .3 Coloured Identification
- .1 Use the following colours to identify different systems:
 - .2 All horizontal UTP cables shall be coloured blue.
 - .3 All workstation jacks shall be coloured white.
 - .4 All jacks in patch panels shall be coloured black
 - .5 Patch cords shall be coloured as follows:
 - (a) data = white
 - (b) voice = blue

5 COMMISSIONING OF COMMUNICATIONS

5.1 GENERAL

- .1 Provide Commissioning Verification, Inspection and Certification.
- .2 Provide commissioning verification, inspection and certification of all communications cables installed.
- .3 100% of all cables installed must be tested, and certified.

5.2 COPPER CABLE TEST REQUIREMENTS

- .1 Every cabling link in the installation shall be tested in accordance with the field test specifications defined by the Telecommunications Industry Association (TIA) standard ANSI/TIA/EIA-568-B.1.
- .2 The installed twisted pair horizontal links shall be tested from the IDF in the Telecommunications Room to the telecommunication outlet in the work area against the Basic Link performance limits specification as defined in ANSI/TIA/EIA-568-B.1.

- .3 100% of the installed cabling links must be tested and must pass the requirements of the standards mentioned in above specifications. Any failing links must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation in accordance with Section below.
- .4 Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests.
- .5 The test equipment (tester) shall comply with the accuracy requirements for Level III field testers as defined in TIA-568-B.1
- .6 The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.
- .7 The tester interface adapters must be of high quality and the cable shall not show excessive twisting or kinking resulting from repetitive coiling and storing of the tester interface adapters.
- .8 The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests. Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*.
- .9 A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks.
- .10 A representative of the consultant and end-user shall be invited to witness field testing. The representative shall be notified of the start date of the testing phase 5 business days before testing commences.
- .11 A representative of the consultant and end-user will select a random sample of 5% of the installed links. The representative (or his authorized delegate) shall test these randomly selected links and the results are to be stored in accordance with the prescriptions in Specifications. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the end-user representative shall repeat 100% testing and the cost shall be borne by the installation contractor.

5.3 COPPER CABLE TEST STANDARDS

- .1 Test all horizontal copper cable links to Category 6 standards.
- .2 The test parameters for Category 6 are defined in ANSI/TIA/EIA 568B.1. The test of each link shall contain all of the following parameters as detailed below. In order to pass the link test all measurements (at each frequency in the range from 1 MHz through 250 MHz) must meet or exceed the limit value determined in the above-mentioned Category 6 standard.

- .3 When testing cables the correct NVP value must be entered in to the tester for the particular cable being tested or the test results will be considered void.

5.4 TEST RESULT DOCUMENTATION

- .1 The test results information for each link shall be recorded in the memory of the field tester upon completion of the test.
- .2 The test results records saved by the tester shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records. A guarantee must be made that these results are transferred to the PC unaltered, i.e., "as saved in the tester" at the end of each test.
- .3 The test results records saved by the tester shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records. A guarantee must be made that these results are transferred to the PC unaltered, i.e., "as saved in the tester" at the end of each test.
- .4 The database for the completed job shall be stored and delivered on CD-ROM including the software tools required to view, inspect, and print any selection of test reports.
- .5 A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information
- .6 The identification of the link in accordance with the naming convention defined in the overall system documentation.
- .7 For OTDR testing include all ray traces and graphical outputs.
- .8 The date and time the test results were saved in the memory of the tester. Ensure that the correct information has been entered.
- .9 Test results must be received by the Consultant for review within 2 weeks of completion of testing or they will be considered void.

5.5 CLEAN-UP

- .1 General
 - .1 Remove all redundant cables completely-both horizontal and vertical cable
 - .2 All existing cables and communications equipment needs to be removed.
 - .3 The Telecommunications Rooms are to be cleaned using canned compress air suitable for cleaning electronic equipment. All equipment shall be cleaned of dust and debris. The floors are to be vacuumed and all garbage removed prior to the owner taking occupancy.
 - .4 Do not dust and vacuum until all trades have completed work.

5.6 OCCUPANCY

.1 General

- .1 When the owner is ready to take occupancy the Communications Contractor is to provide an onsite communications technician to assist during the move.
- .2 The communications technician is to have extensive knowledge in the design and construction of the system.
- .3 The communications technician is to assist the owner during the move and answer any questions related to the system.
- .4 If the owner deems the technician unable to provide proper assistance for any reason, another technician will be provided by the contractor immediately with no addition charge to the owner.
- .5 The owner will decide the time and date that the technician is to arrive. The owner must give at least 48 hours notice to the communications contractor before such time.
- .6 The technician is to remain on site for a maximum of 8 hours. These hours may occur during premium time or during weekends. Any additional time must be arranged with the Communications Contractor.

6 EXECUTION

- 1 Data Cable Installation
- 2 Communications cables shall be placed through shafts, conduit, raceways or floor penetration. All optical fibre shall be handled, installed, and supported as per the manufacturer recommendations. During the laying of the cable, installer shall take care not to stress the cable. After the cable is installed, the installer shall make sure that all parts of the cable are supported properly according to the manufacturer guidelines. There shall be acceptable (to the manufacturer) minimum physical stress on installed cables.
3 In order to achieve a level of reliability that approximates that of a factory manufactured connector, field installable connector shall have a factory physical contact (PC) polish. Every fibre shall be terminated with the appropriate pigtail cable with factory installed connector, tested and test results provided in writing to Purchaser. The fibre patch cord shall consist of two single, buffered, graded index fibres with a 50 micro-meter core and a 125 micro-meter cladding (or 9.0/125 :m for single mode fibres). All fibres will be run in metal raceway and terminated in the TC's with SC connectors rack or wall mounted fibre optic patch panels equipped with sufficient panels, couplers and jumper storage shelves to terminate and secure all fibres.
- 4 The fibre cable shall be protected by metal raceway or appropriate apparatus at all times. Each end of the fibre cable shall contain a slack storage box with approximately seven feet of cable slack.
- 5 Communication Contractor shall be required to supply #6 AWG for grounding all equipment including communication cable trays.
- 6 All fibre cable not run in conduit shall be enclosed in appropriate flexible spiral wrapping for maximum mechanical and environmental protection. This includes up communications rooms riser.
- 7 The spiral wrapping shall be installed 'buted' and shall meet all relevant codes.
- 8 Supply all materials and labour for the installation of the complete Riser Cabling system including all cables and terminations.

- 9 Ensure that proper cable support techniques are utilized for suspending and supporting riser cables as per manufacturer's specifications. Cable ties shall also be used to prevent side to side movement of the cable. The cable ties shall not be installed so as to deform the cable jacket.
- 10 Fibre cable inside Communications Room shall be protected with max 0.97" cross-sectional area innerduct FT4 rated. The installation must be done in compliance with OBC 3.1.5.19
- 11 Provide, install and terminate the indicated quantities of riser cables in the communications rooms.
- 12 Communication Contractor shall be required to supply #6 AWG for grounding all equipment including communication cable trays.
- 13 The spiral wrapping shall be installed 'butted' and shall meet all relevant codes.
- 14 Supply all materials and labour for the installation of the complete Communications Cabling system including all cables and terminations.
- 15 Ensure that proper cable support techniques are utilized for suspending and supporting riser cables as per manufacturer's specifications. "Velcro" cable ties shall also be used to prevent side to side movement of the cable. The cable ties shall not be installed so as to deform the cable jacket.
- 16 Provide, install and terminate the indicated quantities of riser cables in the communications rooms.
- 17 All cables shall be neatly bundled, tie-wrapped and routed together. Secure cable bundles to vertical and horizontal supports and neatly fasten to plywood backboards or termination racks when routing to termination panels.
- 18 Installation shall be suitably tested and demonstrated to the Engineer consistent with standard industry practice.
- 19 Connect equipment is to closet ground bus with #6 AWG green grounding wire.
- 20 Submit shop drawings of all communications equipment, cabling, receptacles and miscellaneous hardware.
- 21 Installation shall conform to the standard, EIA/TIA 568A. The length of each individual run of horizontal cable from the administration subsystem (Communications Closet) on each floor to the information outlet shall not exceed 295 ft (90 m).
- 22 All cables shall be neatly bundled and tie-wrapped. Secure cable bundles to vertical and horizontal supports in Communications rooms to support cable bundles.
- 23 Utilize all indicated and available cable pathways such as conduit, cable trays, ducts, raceways and furniture system channels except where otherwise noted. Exercise caution when pulling cables in such pathways to avoid damage to any cabling and to ensure that the cable manufacturers' maximum pull-force and minimum bend radii specifications are adhered to.
- 24 All free-running cables shall be securely fastened to appropriate cable supports and harnesses a minimum of every 1500mm so that cables are bundled tightly. All cables shall be completely supported by the harness so that the entire mass of the cables and the harnesses is self supporting and no weight is transferred to any other existing fixture or structure in the ceiling space (such as suspended ceiling or light fixtures), The Contractor shall be responsible for the supply of all materials (such as hangers, harnesses or supports) and labour that may be required to achieve this.
- 25 Route all cables to maintain minimum separations from sources of lighting, power cables, HVAC and electrical equipment as indicated in the "NORDX/CDT" minimum separation schedule or otherwise required. The Contractor shall be responsible for the supply of all materials (such as hangers, harnesses or supports) and labour that may be required to maintain the indicated minimum separations.

- 26 In the building Communication Closets all communications cables shall be neatly tie-wrapped, bundled, supported and routed to the corresponding termination panel in the hub rooms or computer room. The Contractor shall be responsible for the supply and installation of any additional cable supports. Tiewraps on Cat 5e cables must be velcro type only (plastic cable ties are not acceptable)
- 27 The communications contractor is to coordinate the installation of the data and voice cables with other contractors and tenants as required for the installation of these cables.
- 28 Inform the Consultant of any cable lengths in excess of 90 m in length prior to installation.
- 29 Each run of cable between the termination block and the data outlet shall be continuous without any joints or splices.
- 30 In suspended ceiling and raised floor areas where systems duct, cable trays or conduit are not available, the Contractor shall bundle station wiring with velcro cable ties at appropriate distances (plastic cable ties are not acceptable for Cat 5e cabling). The cable bundling shall be supported via "J" hooks attached to the existing building structure and framework. Plenum cable will be used in all appropriate areas where cables are not enclosed in metal raceways or concrete encased conduits.
- 31 If the interior of walls are not obstructed, the Contractor shall conceal horizontal distribution wiring internally within the walls. If such obstructions exist. Contractor shall secure approval prior to the use of an alternate method.
- 32 Where the Contractor is required to remove ceiling tiles, such Work shall not break or disturb grid or tiles.
- 33 Contractor shall provide detailed cable run diagrams for cable runs within raised floors detailing exact locations of cable for review and approval after coordination with other contractors and engineer.
- 34 Conduit runs installed by the contractor should not exceed 100 feet or contain more than two 90 degree bends without utilizing appropriately sized pull boxes.
- 35 Dedicated four-pair 24 AWG UTP horizontal distribution cable shall be provided for each application or service planned, present and future, Each of the four cable pairs of each horizontal cable must be terminated on an individual 8 position modular connector at the telecommunications outlet/connector. Pairs within a cable shall not be split and all pairs must be terminated.
- 36 The splitting of pairs within a cable between different jacks is not permitted. Terminating resistors in the case of ISDN applications shall be placed external to the telecommunications outlet/connector.
- 37 Cable shall be provided on reels or in Reelex boxes. Cable shall be marked decrementally from 100 ft to indicate both the length of a run as well as the amount of cable remaining on the reel or within the carton
- 38 The installation of the horizontal cable shall follow the appropriate recommendations covered in the Manufacturer's Design Guide and the appropriate standards documents. This is done in order to ensure adequate protection from Electro-Magnetic Interference (EMI) sources and to ensure that all components and cables are in good condition after installation.
- 39 Copper cables shall be handled, installed, and supported as per the manufacturer's guidelines. During the laying of the cable, installer shall take care not to over stress the cable. After the cable is installed, installer shall make sure that all parts of the cable are supported properly and shall be stress free at both ends and throughout their length.
- 40 Appropriate attention shall be given to the handling of Category 5e copper and optical fibre cables to ensure that bending radius conforms to the manufacturer's requirements. At no time shall the cable's static or dynamic bending radius be exceeded.

- 41 All telecommunications outlet/connectors shall be securely mounted at all work area locations and shall be located so that the cable required to reach the work area equipment will be no more than 3 meters long.
- 42 All optical fibre and copper cables shall be handled, installed, and supported as per the manufacturer's guidelines. During the laying of the cable, installer shall take care not to over stress the cable. After the cable is installed, installer shall make sure that all parts of the cable are supported properly and shall be stress free at both ends and throughout their length.
- 43 Appropriate attention shall be given to the handling of Category 5e copper and optical fibre cables to ensure that bending radius conforms to the manufacturer's requirements. At no time shall the cable's static or dynamic bending radius be exceeded.
- 44 All telecommunications outlet/connectors shall be securely mounted at all work area locations and shall be located so that the cable required to reach the work area equipment will be no more than 3 meters long.
- 45 The total optical attenuation through the cross-connect from any terminated fibre to any other terminated fibre shall not exceed 2.0 dB. Optical fibre splices, fusion or mechanical, shall not exceed a maximum optical attenuation of 0.3 dB when measured in accordance with ANSI/EIA/TIA-455-34.
- 46 Surface mount telecommunications outlets where indicated shall provide up to six telecommunications outlet/connectors.
- 47 A non-impact termination method using either a stuffer cap with pliers or fullcycle terminating tool having both tactile and audible feedback to indicate proper termination shall be used. High impact tools are not permitted.
- 48 Terminated conductor ends shall be properly trimmed to assure a minimum clearance of 0.250 in. between the conductors of adjacent modules.
- 49 Face plates shall be clean in appearance. Mounting hardware shall not be visible on the faceplate. If colour coded modules are employed, colors shall comply with the requirements of CAN/CSA 528.
- 50 The work area telecommunications outlet/connectors shall not be responsible for creating "resonance" on short cable runs as described 'in the Field Testing TSB 67 (Draft 13 section 7.8 Short Links/Channels). This problem is related to return loss and/or the balance of the link and can cause transmission errors.
- 51 Telecommunications outlet/connector shall require (or specifically not allow more than) only one single connection to horizontal cable as per TIA/EIA-568-B.
- 52 Flush mounted face plates shall accommodate modular telecommunications outlet/connectors and be available in four connectors per single gang telecommunications outlet.
- 53 All telecommunications outlets shall be made of high impact plastic.
- 54 The same modular telecommunications outlet/connectors as found in the flush and surface mount telecommunications outlets shall be installable in utility poles and modular furniture using manufacturer face plates or adapters for this purpose. Each telecommunications outlet shall house as many as three telecommunications outlet/connectors.
- 55 The eight position modular UTP telecommunications outlet/connector and its pin assignments shall meet the requirements described in the standard CAN/CSA-T529 as T568A.
- 56 Each telecommunications outlet shall be uniquely labelled. The label shall form an integral part of the faceplate.

7 WARRANTY

- 1 Provide written verification confirming that the testing and inspection has been completed and that all cable runs have passed. Also document that all defects have been identified, corrected, and retested successfully.
- 2 Contractor shall provide a 25 year Extended Product Warranty and System Assurance Warranty for this Structured Cabling System.
 - .1 Provide "NORDX" IBDN certification, certifying that the cabling system is Installed In accordance to manufacturer's Category standards. The certification must include a minimum of 25 years application assurance warranty, which warranties that the installed cabling system Is compliant with standard current network applications and emerging technologies such as TPPMD, 100 Mbps Ethernet, Gigabit Ethernet, UTP based ATM and other 100 + Mbps applications.

END OF SECTION

1. GENERAL

1.1 Conformance

- .1 Conform to Division 1 - General Requirements.
- .2 Conform to Division 26 - Electrical General Requirements.

1.2 Shop Drawings and Product Data

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

1.3 Work Included

- .1 A/V Supplier to provide a complete working system including equipment, low voltage wiring and power supplies, and rack hardware for: **Audio and Visual Systems**. System components shall consist of state-of-the-art components and associated controls.
- .2 Division 26 to provide all 120V power requirements, including empty conduits, backboxes, floorboxes with pull strings. Include a 12"x12" in-wall box at the rack location connected to the required conduit. Provide Data and Hospital network cabling and connections where required.
- .3 AV Integrator to supply the Display Back Boxes (Chief PAC 526) to Division 26, who will install in conjunction with the conduit installation.
- .4 G.C. to provide ¾" plywood backing support for display monitor. Coordinate with AV Integrator.
- .5 Furniture provider to provide cut-out in table for table box where required. AV Integrator to provide cut out template. Coordinate location of table box with AV Integrator.

1.4 Submittals

- .1 Submittals shall be of adequate depth to define fully the system in its expanded form.
- .2 Shop Drawings: Submit complete sets of shop drawings within 14 days following receipt of purchase order. Shop drawings shall include copies of dimensional drawings completely describing installation that will be performed with relation to the space available for installation.
- .3 Manufacturer's Data: Submit data in the form of catalogue cuts or special data sheets as prepared by the manufacturer.
- .4 Maintenance Data: Submit copies of parts, lists and preventive maintenance requirements for systems to be installed.
- .5 Service Contract: Supplier to provide the contact information for normal and emergency service for the system.
- .6 Deviations: The approval of shop drawings by the Consultant shall not relieve the installer from responsibility for deviation from drawings or the specifications unless he has called attention in

writing to such deviations at the time of submission and has obtained the approval of the Consultant thereon. When such deviations are called to the Consultants attention, and no mention is made of extra cost, it will be assumed that any proposed change will be made at no extra cost to the Owner.

- .7 Substitutions: The intent of these Specifications is to establish the quality of the materials and/or workmanship desired for this project. Unless stated "no substitutions", any substitutions shall be in conformance with the requirements indicated.

1.5 Product Installation and Handling

1. Before and during installation care must be exercised to prevent damage to the sensitive parts and components of the system and be responsible for the storage and handling of all components until acceptance of the completed installation.
2. Do not install sensitive equipment until the work site is cleaned and free from dust.

1.6 System Verification

1. Test and demonstrate the operation of the complete expanded system to the Owner. This shall include, but not be limited to:
 2. detailed test and demonstration of each operable device,
 3. detailed test and demonstration of overall system operation
4. On completion of the installation the supplier shall supply detailed inspection record sheets showing location of each device and certifying the test results per unit, confirming that the system is installed and operates in accordance with Specification.

1.9 GENERAL

- 1.9.1. The specifications for the Audio & Visual Systems are a description of the various components with the minimum requirements and the operational sequence.
- 1.9.2 The following is a general description of the components required in the **STAFF ROOM K3C00B and TEAM ROOM K3C00C**.
- 1.9.3 .1 The design and function is to be able to operate each room as their own separate system, or when the user opens the room divider, that both rooms will operate together as one single system.
 - .2 Each room will be controlled using a table mounted touch screen to turn each system on/off, select presentation sources, control video conferencing calls, and control the volume individually. When the divider is open, the system will be combined and operate as one single system. Either touch screen will be able to control the combined system in this mode.
 - .3 The A/V Supplier is to create a custom GUI that is intuitive and easy to operate. The touch screen will be a POE device that is connected directly to the control system.
 - .4 The head end equipment for each room will be located into it's own free standing equipment rack. The sources in the rack will be the video conferencing system, digital media distribution from the tables, and an Air Media that provides a wireless option to connect mobile devices such as smartphones and tablets.

- .5 Provide a complete A/V presentation control and signal routing system that integrates the control system, digital media switching, audio DSP, amplifier, wireless gateway, microphones, video conferencing system, PTZ cameras and camera switching system. Provide signal transmitters and receivers where required.
- .6 The A/V system is to be configured and connected to an AV VLAN to allow for security updates, firmware updates and maintenance. Configuration of network to be done by Hospital IT Dept.
- .7 Provide the required POE power and switching in the equipment rack.
- .8 Each Meeting Room is to have an 86" LED 4K commercial display. A Chief in-wall back box is to be provide to Division 26 for installation at same time as conduit.
- .9 Provide in-ceiling low profile speakers to play the audio from the various sources.

Provide in-ceiling microphone with next-generation array architecture for enhanced directional pickup anywhere inside the room.
- .10 The requirement is to be able to make video conferencing calls from any platform (ie: Teams, Zoom, Webex) in either Meeting Room. Telephone systems are not a part of this scope and any telephony equipment is provided by others.
- .11 Provide a voice-activated camera switching solution that brings the full multi-camera experience to meetings, and video conferencing. Camera switching and movement is done automatically based on the location of the active speaking participant. See who is speaking with close-up camera shots and also wide shot of all participants displayed simultaneously. Clean production-style camera switching provides a more engaging experience for remote participants or viewers. (3) compatible automated PTZ cameras are to be located above each display in each room. The system is to come with built-in recording and streaming capability along with outputs for video conferencing.
- .12 All PTZ cameras are to be certified for use with Microsoft Teams and support HD-SDI connectivity. Program cameras in conjunction with Crestron Automate VX auto camera switching.
- .13 Users can make Teams video conference calls without the need of bringing a laptop with them, however, the system will also have a connection at the table that provides the flexibility to use any conferencing software from their laptop to conduct calls. The cameras and microphones are to be configured work with the laptop in these scenarios.
- .14 Provide table connectivity in the center of the meeting room table. The connectivity from the table box will route through the floor box. It is suggested that the floor box be located inside or beside one of the table support legs for best esthetics and ability to hide cabling. An access door to the inside of the table supports is to be supplied by the table provider if applicable. Any AV transmitters and receivers are to be located inside the table support legs. If the design of the supports does not facilitate mounting equipment and routing cables inside, then locate under the table in a manner to minimize the equipment and cabling from plain site.
- .15 System to have a secure wireless connection. With Air Media technology, users can wirelessly present content from laptops, smartphones, and tablet devices via an external Wi-Fi wireless network. When no source is connected, the AM-3200 displays a customizable welcome screen on the room display with simple instructions for connecting and presenting. It must have Enterprise-grade security and content encryption protects privacy and ensures compliance with IT policies. Unit to have 2 network connections which can be programmed by IT (ie: one could be a

guest network).

- .16 AV Integrator to provide connectivity in table box for the following:
 - (2) Dual receptacles
 - (1) HDMI connection on a pull-out retractor cable. For a laptop (or any other HDMI source) to be shown on the display.
 - (1) USB-B for laptop BYOD mode
 - (3) Network connections. Male RJ-45 connector on pull -out retractor cables; (2) will be for Hospital Network or any network configuration as required by IT; (1) will be for the Crestron Touch Panel.
 - (2) USB charging ports (Connections for USB-A/B and USB-C format)
- .17 AV Integrator to wire manage and install cable from table box to floor box. It is recommended that the table provided should have wire management built into itself to hide the cabling from plain view. The table box shall feature a one touch lid that retracts and disappears when opened.
- .18 Division 26 to provide a Legrand Evolution Series floor box large enough to install two power receptacles, network connections, and A/V connections as required. Electrician must coordinate the make and model of floor box before installation to confirm compatibility with AV plates.
- .19 Provide all manufacturer recommended cabling and connectors.

1.9.4 PRODUCTS

- .1 Equipment Rack
 - .1 Provide a 19 space free standing rack with all required shelving, blank panels, power distribution, locking front door, wire management and thermal management hardware.
 - .2 Middle Atlantic BGR-19SA27MDK-XX.
 - .3 Coordinate top-side finish with owner.
- .2 Digital Media Distribution
 - .1 Crestron NVX encoders and decoders
 - .2 HDMI switchers as required
 - .3 NVX Compatible POE network switch
- .3 Touch Screens
 - .1 Crestron TS-1070
- .4 Speakers
 - .1 2-way In-ceiling recessed – white - Low Profile
 - .2 8 Ohms or 70V multi-tap
 - .3 6.5" woofer and wide dispersion
 - .4 QSC AD-C6T-LP or equivalent
- .5 Monitor Mounts
 - .1 UL Listed
 - .2 Chief RLXT3 or similar

- .6 Table Boxes
 - .1 As configured in 1.9.3.1.16
 - .2 Crestron FT2-1400-ELEC-PTL-B Series
 - .3 Coordinate finish colour with owner

- .7 Video Conferencing System
 - .1 Enterprise-Grade Security
 - .2 Present, call, conference, and collaborate using your own device's UC conference platform (BYOD) or the native Microsoft Teams Rooms platform
 - .3 3 years of Flexcare 24/7, year-round live Crestron support
 - .5 Crestron UC-CX100-T

- .8 Display Panels
 - .1 86" with 4K resolution
 - .2 18/7 rated duty cycle
 - .5 Sharp, NEC, Samsung or LG are acceptable

- .9 Monitor Back Boxes
 - .1 Stud mountable
 - .2 Knockouts for single gang outlets and 1.25", 1" and .5" conduit
 - .3 6 Receptacles with non-sacrificial multi-stage filtration and surge protection
 - .4 White flange
 - .5 UL listed
 - .6 Chief PAC526FWP6

- .10 Media Transport
 - .1 Crestron HDBaseT or NVX is acceptable

- .11 Multi-Camera Switching System
 - .1 Voice Activated
 - .2 Compatible with Shure MXA-920
 - .3 Include all hardware and required adaptors
 - .4 Crestron Automate VX

- .12 PTZ Cameras
 - .1 HDMI Output
 - .2 Full HD resolution
 - .3 IP or serial control
 - .4 Automatic Optimal Framing
 - .5 Compatible with Crestron Automate VX
 - .6 (2) 1 Beyond IV-CAMPPTZ-12-N-SLVR-1B
 - .7 (4) 1 Beyond IV-CAMPPTZ-20-N-SLVR-1B

- .13 Microphone System
 - .1 8 separate adjustable lobes
 - .2 Ceiling or in-ceiling mounting option
 - .3 Network Audio Encryption
 - .4 Shure MXA920 ceiling mic array

- .14 Control System
 - .1 Crestron CP4N

- .15 Wireless Collaboration Connectivity
 - .1 Crestron AM-3200
- .16 AV Network Switch
 - .1 AES67 compatible
 - .2 POE+
 - .3 30 port – 24 POE
 - .4 Layer 2 and Layer 3 managed switching functionality
 - .5 NVX Compatible
 - .6 Netgear CEN-SWPOE-30 or equivalent
- .19 Digital Signal Processor
 - .1 QSC CORE 110V2 or other Q-SYS Components
- .20 Audio Amplifiers
 - .1 Provide 2 channels of amplification per room
 - .2 Minimum of 50W per channel
 - .3 Acceptable Manufacturer's: QSC
- .21 HDMI Auto Switcher
 - .1 4K resolution
 - .2 2 HDMI inputs, 1 output
 - .3 Built-in scaler
 - .4 Quick switch HD Technology
 - .5 Crestron HD-MD4X1-4KZ-E as required

1.9.8 SUPPLIER

- .1 System shall be as **supplied by Aatel Communications (contact Mike Moore at 905-526-2393, email mikem@aatel.com)**
- .2 System installation will include the following:
 - .1 Supply and installation of control equipment.
 - .2 Supply and installation of all system equipment and devices.
 - .3 Supply and installation of all wiring required for complete system operation.
 - .4 All required device set-up and system programming, testing and verification including all user selectable functions set up to Hospital's desired settings. Review settings with Hospital prior to implementation.
 - .5 Complete instruction to Owner on system operation.
 - .6 Factory prepared operation and service manual for each system, operation details, schematics, wiring diagrams, colour coding, terminal numbers, and component values for printed circuit boards.
- .3 Operation and Maintenance Data
 - .1 Provide operation and maintenance data for incorporation into manual.
- .4 System Verification
 - .1 Test and demonstrate the operation of the complete system to the Owner. This shall include, but not be limited to:
 - .1 detailed test and demonstration of each operable device
 - .2 detailed test and demonstration of overall system operation
 - .3 interfacing of various components.
 - .4 provide one (4) hour training session for Hospital Representatives

- .2 On completion of the installation the manufacturer/supplier shall supply a certificate, together with detailed inspection record sheets showing location of each device and certifying the test results per unit, confirming that the system is installed and operates in accordance with Specification.
- .5 The contractor shall provide a complete and fully functional Audio/Video system using materials and equipment of types, sizes, ratings, and performances indicated.
- .6 Materials and equipment shall comply with the referenced standards and the manufacturers' standards.
- .7 The contractor shall coordinate the features of the materials and equipment so that they form an integrated system with components and interconnections matched for optimum performance of specified functions.
- .8 All equipment, installation material and labour required to fulfill the functional and performance criteria of the Audio/Video System, as described in this Specification, shall be furnished whether or not enumerated herein or on this specification.
- .9 The systems and components shall be of modular design, completely solid state and be high quality professional audio and video products.
- .10 All equipment, wiring and wiring devices supplied shall meet the requirements of the authority having jurisdiction and shall be CSA and or Ontario Hydro approved. The total work specified herein shall comply strictly to the requirements of the latest edition of the Ontario Building Code or the Canadian Electrical Code, as appropriate. This code and any additional requirements of the Authority having jurisdiction constitute an integral part of this Specification, and in case of conflict, the Code shall take precedence over this Specification.
- .11 Conduit, raceways, floor boxes and associated J-boxes are to be provided by Division 26 Contractor. Audio video contractor shall inspect provided supporting AV infrastructure and provide all additional components required for installation of AV systems.
- .12 Final payment will be approved upon acceptance of the completed installation by the owner or the Engineer.

1.9.14.9 Submittals

- .1 The shop drawings shall include:
- .2 Block diagrams showing the proposed interconnection of all equipment and equipment racks.
- .3 Riser diagram(s) showing all system devices and their appropriate cable requirements, AC requirements, equipment rack locations, conduit sizes, loudspeaker types and locations, and sensing device locations etc.
- .4 Equipment rack drawings showing the Equipment layout.
- .5 Equipment catalogue sheets with the pertinent specified parameters highlighted.
- .6 Circuit diagrams, descriptive information and operating instructions for all custom equipment to be furnished, ie. control and switching equipment, special panels etc.

- .7 Fastening and mounting arrangements for all devices including loudspeakers.
- .8 The Engineer's review or approval of shop drawings does not relieve the Contractor from responsibility for providing a complete and operating system.
- .9 Notes or changes to the shop drawings by the Engineer are not intended to alter the value of the work. The Engineer shall be advised, in writing of any notation or change which will affect the Contract Price. Do not proceed with the subject work until officially notified.
- .11 Include an overall system schematic indicating the relationship of each system component on one diagram.
- .12 Drawings shall include wiring diagrams and installation details of hardware and cables indicating proposed locations, conduit, layout and arrangements, and other items that must be shown to ensure a coordinated and compliant installation.
- .13 Within 10 working days after final system acceptance, the contractor shall provide two electronic copies of "as-built" drawings, showing all "as-built" and "as-found" conditions pertaining to this work. One set shall be provided to the owner; one set shall be provided to the designated engineer.

3.0 EXECUTION

- 3.0.1.1 All work shall be done in a workmanlike manner by tradesmen skilled in the class and kind of work and shall be neat and clean when completed.
 - .2 All equipment shall be firmly held in place. Full range Cabinets and Ceiling speakers shall be fastened in an approved manner and speaker cabinets shall be firmly supported. All devices shall be fixed with fastenings and supports as specified.
 - .3 Mount all equipment, boxes, exposed wiring or other devices plumb and square. Moderate relocation of equipment, as is necessary to preserve a favourable appearance, shall be made without claim.
 - .4 Wiring shall be installed in EMT raceway provided by this contractor. If conduits are not provided, this contractor shall provide plenum rated cables and install cables using J hooks or other cable supports.
 - .5 If short cable runs must be run exposed, approval of routing and materials must be obtained from the Engineer before commencing the work.
 - .6 Conduits shall be routed and audio equipment shall be located to circumvent all interferences.
 - .7 All operating controls, switches, jacks, plugs and accessories shall be permanently marked in a clear logical manner utilizing embossed letters or lamicoïd plates.
 - .8 All wiring shall be properly identified in function boxes, at terminal blocks and where accessible.
 - .9 Include in the tender price all costs associated with using lifts or another equipment for installing wiring and speakers. No allowance will be made for extra cost as a result of site conditions and hardship claims will not be entertained.

.10 Electrical Interference

- .1 Adequate precautions shall be taken to prevent electromagnetic and electrostatic interference and hum.
- .2 Equipment rack wiring and other electronic equipment wiring shall be placed and terminated in screw-type terminals or approved plugs. Permanent rack wiring shall be made with resin-core solder.
- .3 Standard engineering practices for separation of power, loudspeaker, line level, DC control and microphone level circuits shall be adhered to in equipment rack assemblies.
- .4 Speaker lines and DC control lines shall be spliced, if required, only in accessible junction boxes. All shielded cables shall be run continuous without splices. Separate conduits for speaker, line level and microphone level circuits shall be utilized. All speaker terminations shall be made with insulated crimp connectors or spade type terminations to barrier style terminal blocks.

.11 Performance and Adjustment

- .1. Optimize the system performance within the limits of the specified equipment and device capabilities. Adjust the signal processing equipment, amplifiers, loudspeaker power, phasing and orientation to achieve performance satisfactory to the Consultant.
- .2 Verify that the complete system is free from R.F. pickup, parametric oscillations, hum, buzzes, rattles or distortion by:
- .3 If need for adjustment becomes evident during the acceptance testing, work shall be continued until the system installation operated as specified, without extra cost to the Contract.

.12 Demonstration and Training:

- .1 Demonstrate the system's operation, maintenance and service procedures to the Owner's designated personnel.
- .2 Provide one (4) hour training session for designated staff, demonstrating all functions of the AV system. Co-ordinate training times with Hospital.
- .3 Supply a hard copy "1-page quick guide" of the operation of the system for each room to the owner for future reference.

.13 Warranty

- .1 The total system shall be guaranteed for a period of (3) year on parts and labour. Extended material warranties, offered by any of the equipment suppliers, shall be provided to the Owner and indication of any such extension shall be noted in the maintenance service manuals to be provided.
- .2 If any materials or workmanship prove to be faulty during their guarantee period(s), without cost to the Owner between 08:00 and 16:30 hours (Monday to Friday), undertake the following:

- .1 Respond remotely within (4) hours to the service call if problem can be assessed remotely. It is the responsibility of Hospital to provide remote access for this purpose.
- .2 Respond to minor failures within the next business day. Examples of a minor failure are a remote control not working, or loose connections.
- .3 Respond to major failures within 8 hours. Example of major failures are blown projector bulbs or display panels not powering up.
- .4 AV supplier to provide a owner with a list of minor and major failure examples.
- .5 The instruction manual shall be prepared with detail description for operation and troubleshooting
- .6 Provide a maintenance and service contract for (3) years that includes a minimum of (2) site visits for the purpose of checking and adjustment of the system.
- .7 Provide owner with spare parts where described elsewhere in this section.

END OF SECTION

CODE WHITE SYSTEM

27 52 23

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.
- .2 Conform to Section 26 05 01, Electrical General Requirements.
- .3 The system shall be CSA and/or UL approved Standard 1069 Hospital Signaling and Nurse Call Equipment.
- .4 Transistors, capacitors, integrated circuits, and other components shall not be operated to exceed their rated values. Design systems for 24-hour continuous operation.
- .5 **Conform to the “Sunnybrook – Code White, Code Blue & Nurse Call Installation policy” appended to this Specification**

1.2 CODE WHITE SYSTEM

1.3 WORK INCLUDED

- .1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation of Code White System as shown as specified and as otherwise required.
- .2 System will include the following:
 - .1 Supply and installation of control equipment including auxiliary power supplies.
 - .2 Supply and installation of all system equipment and devices (both Pushbuttons and Wireless Receivers as shown).
 - .3 Supply and installation of all wiring required for complete system operation.
 - .4 All required system programming, testing and verification.
 - .5 Complete layout, wiring and installation diagrams for overall system design.
 - .6 Complete instruction to Owner on system operation.
 - .7 Technical data on each product, including finishes.
 - .8 Factory prepared operation and service manual for each system, operation details, schematics, wiring diagrams, colour coding, terminal numbers, and component values for printed circuit boards.

1.4 SPARE COMPONENTS

- .1 Include in the Bid the following additional components including installation (include an average of 100'0" of wire in conduit for each additional device and connection to an adjacent zone/ circuit). Assume, for bidding purposes, that these devices can be added at any time during construction including at the end of the construction and in any location as directed on site. Any devices not installed shall be turned over to the Hospital:

one (1) extra Code White Button c/w connection to the Code White System

1.5 **SYSTEM VERIFICATION**

- .1 Test and demonstrate the operation of the complete system to the Owner. This shall include, but not be limited to:
 - .1 detailed test and demonstration of each operable device
 - .2 detailed test and demonstration of overall system operation
 - .3 interfacing of various components.
- .2 On completion of the installation the manufacturer/supplier shall supply a certificate, together with detailed inspection record sheets showing location of each device and certifying the test results per unit, confirming that the system is installed and operates in accordance with Specification.

PART - 2 PRODUCTS

2.1 **GENERAL**

- .1 The Specifications for this system are a description of the various components with the minimum requirements of the operational sequence, facilities and features required.

2.2 **CODE WHITE (PERSONAL ALERT PANIC ALARM) SYSTEM**

- .1 Provide, as indicated on the plans, a wireless Code White (Personal Alert Panic Alarm) System complete with a combination of both fixed location Code White Buttons and Wireless Receivers. The System shall be integrated to the existing Hospital Central Code White System. Receivers/buttons shall be located where indicated on the drawings and provide adequate coverage insuring system operation anywhere within each room.
- .2 The system shall permit staff in areas equipped with the Code White receivers to carry wireless pendants which, when activated, will signal emergency call placement causing the following to occur;
 - .1 annunciate on the local annunciator,
 - .2 simultaneously signal the main security office via a new remote console installed within the security office.

The System Code White Pushbuttons shall permit the same operation

- .3 The system shall include all necessary hardware and software permitting the future integration to the facilities in house pocket paging system enabling Code White calls to be dispatched to security personnel remotely via alpha-numeric pocket pager.
- .4 Discreet annunciation shall be provided by the Code White system at the local annunciator via a touch screen master console, and at the Security Office defining the call type and pinpointing location by room number where the call originated.
- .5 All supplied transmitters must be compatible with all supplied system receivers enabling staff to use any transmitter for Code White call placement wherever they may be provided the room is equipped with a Code White receiver. Systems which only permit a specific transmitter to be used with a specific receiver to provide discreet annunciation will not be acceptable. Systems which cannot prevent transmitter to receiver overlap and provide an accurate location where the call originated will not be acceptable.
- .6 Supply a quantity of 50 (fifty) lightweight battery operated wireless pendant style transmitters each unit shall weigh less than two ounces. Transmitters shall include a yellow low battery warning indicator LED that when lit indicates the transmitter requires battery replacement.

Transmitters shall use a standard 12 volt "N" type battery. Include with the system one spare battery for each transmitter supplied. Under normal usage the battery life expectancy will be six (6) months.

- .7 Calls originating by activating the wireless pendant shall be latching and can only be canceled by resetting the individual transmitter which was used to originate the call. Systems that enable remote reset of alarms will not be acceptable.
- .8 The Code White receivers shall be flush ceiling/ wall mounted on a brushed stainless
- .9 Manufacturers
 - .1 **The manufacturer for this system to be manufactured/ supplied by:**
 - **For Pushbuttons: Rauland**
 - **For Wireless: 'CENTRAK'**
 - **and all as supplied by Aatel Communications.**

PART - 3 EXECUTION

3.1 INSTALLATION

- .1 Provide a complete Code White System as shown and as specified.
- .2 Install Wireless Receivers as indicated on Drawings with suitable backboxes.
- .3 Wiring to be of a type recommended by manufacturer, to be colour-coded, and to be installed in conduit.
- .4 Provide interface wiring from Code White System to the existing Central Code White System via the Hospital Network.
- .5 Test complete installation.

END OF SECTION

CLOCK SYSTEM

27 53 13

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Conform to Section 26 01 01, Electrical General Requirements.
- .2 Conform to Section 26 05 01, Electrical Basic Materials and Methods.
- .3 Conform to Section 27 15 00, Communications Cabling.

1.2 REFERENCES

- .1 Industry Canada specifications RSS 119 Issue 6.
- .2 Bluetooth wireless technology standard 4.1.

1.3 WORK INCLUDED

- .1 Work to be done under this Section includes furnishing of labour, materials, software and equipment required for installation, testing and putting into proper operation complete systems as shown as specified and as otherwise required.
- .2 Furnish and install all system devices, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating Wireless Clock System using the Primex OneVue platform. The model designations are that of Primex.
- .3 System to include the system devices below:

.1 Digital Clocks

1.4 SYSTEM DESCRIPTION

- .1 General Specifications
 - .1 System to provide synchronized time by way of system devices and a cloud-based system software hosted by the Manufacturer that allows Owner to manage and monitor system devices.
 - .2 System shall consist of system Clocks enabled with IP Ethernet/PoE technology.
 - .3 System shall provide synchronized time by way of system devices connected to IP Ethernet/PoE network
 - .4 System shall not require the installation of any onsite system hardware or software, with the exception of the specified system devices.
 - .5 Clocks shall be capable of automatically adjusting for Daylight Saving Time.
 - .6 Clocks shall be fully portable, capable of being relocated at any time.
 - .7 Clocks shall receive UTC time from a Network Time Protocol (NTP) time source; allow up to three NTP time sources for failover purposes.
 - .8 Clocks shall operate with a free-running accuracy of .45 seconds per day, and will continue to operate in the absence of receiving the UTC time from an NTP time source.

- .2 System devices with Ethernet network communication
 - .1 Network Communication Protocols: Hypertext Transfer Protocol Secure (HTTPS) | IP Addressing: Dynamic Host Configuration Protocol (DHCP), static IP addressing | Data Packet Size: typically less than 5 kilobytes (kB).
 - .2 Network setting data is stored locally in devices shall be encrypted and access to locally stored setting data can be controlled by a system admin user.
 - .3 Manufacturer to provide stand-alone configuration software to locally configure a device to meet Owner security policies if network setting data cannot be stored in third-party software or to troubleshoot device network connectivity issues.
- 1.5 **SHOP DRAWINGS AND PRODUCT DATA**
 - .1 Submit samples and cut sheets of clocks for review and selection of the desired types and styles. Samples to be equivalent to the specified types and styles.
 - .2 Provide one additional set of reviewed drawings, shipped with the equipment, for start up and maintenance use.
 - .3 Include with the shop drawings;
 - .1 description of system operation,
 - .2 riser diagrams.
- 1.6 **OPERATION AND MAINTENANCE DATA**
 - .1 Include detailed instructions to permit effective operation and maintenance of the equipment.
 - .2 Technical data to be included;
 - .1 Setup and operation instructions,
 - .2 Cut sheets with specification for each component used in the system,
 - .3 List of spare parts included with the system,
 - .4 Illustrated parts lists with part catalogue numbers,
 - .5 “as built” layout, wiring and installation diagrams.
- PART - 2 PRODUCTS**
- 2.1 **SYNCHRONOUS CLOCK SYSTEM**
 - .1 General
 - .1 The system and equipment is specified as described in this section.
 - .2 All bids to be based on the equipment as specified herein. **The model designations are that of Primex.**
 - .2 System Software:
 - .1 Basis of Design Software Product: Primex OneVue
 - .2 System Software Platform: Cloud-based software platform that resides on Amazon Web Services (AWS) and is accessed via the internet.
 - .3 System stores and monitors system devices operating conditions.

- .4 All system device and system settings are managed within the system software.
- .3 Digital Clocks:
 - .1 **The clock LED display must include a 12- or 24-hour time display, a PM indicator light, and an alternating time and date display option.**
 - .2 Clock to be capable of automatically adjusting for Daylight Saving Time.
 - .3 Power over Ethernet (PoE) models shall have an IEEE 802.3af compliant power supply built into the clock assembly.
 - .4 Clock shall have a power outage memory backup and maintain the correct time up in its memory for a minimum of 1 hour without power.
 - .5 Clock shall be viewable from 150 ft. (45.7 m).
 - .6 Clock shall have highly visible 7-segment LED digits.
 - .7 Clock shall have display dimmer options, including 100%, 75%, 50%, and 25%.
 - .8 Clock enclosure shall be ABS plastic and junction box shall be UL listed (UL 50E 1st Ed; listing number E469550).
 - .9 SUPPLY MODELS - Digital Clocks
 - Surface Mount 2.5" Digits
 - Number of Digits: 6 Digit
 - .10 Digit Color: Green
 - .11 Bracket: 4" Slope Bracket,
- .4 System Verification
 - .1 Test and demonstrate the operation of the complete system to the Owner, including:
 - a) **test and demonstration of overall system operation,**
 - b) **test and demonstration of each operable device,**
 - .2 On completion of the installation, manufacturer/supplier to supply documentation including:
 - a) **record sheets showing the location of each device,**
 - b) **record sheets showing the test results for each device,**
 - c) **a certificate confirming that the system is installed and operates in accordance with the Specifications and the Manufacturer's recommendations.**

Standard of Acceptance

Primex OneVue

Supplied by:

Troy Life & Fire Safety Ltd.

Luch Condarcuri

Fire Systems Sales Representative

T: 905 672 5348 ext 303

C: 647 331 0093

luch.condarcuri@troylfs.com

PART - 3 EXECUTION

3.1 EXAMINATION

- .1 Examine conditions with the Installer present for compliance with requirements and other conditions affecting the performance of the system and system devices.
- .2 Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 General: Install system devices in accordance with applicable codes.
- .2 Install system devices in accordance with Manufacturer written instructions.
- .3 Provide all system equipment necessary for a complete and operable system.
- .4 Comply with requirements of Division 27 Sections "Common Work Results for Communications" and "Communications Horizontal Cabling."
- .5 Inspection: Make observations to verify that system devices and components are properly labeled.
- .6 Prior to final acceptance, inspect each system device and component, adjust as required, and replace parts that are found defective.
- .7 At the completion of system device installation and prior to final acceptance, turn on the equipment; ensure that all equipment is operating properly and that the system software and all system devices and components are functioning.
- .8 Commissioning General: Provide system commissioning in accordance with Manufacturer written recommendations. Perform operational testing to verify compliance with requirements. Adjust as required.
- .9 Services shall include a specified level of commissioning services.
- .10 Remote commissioning service: system deployment training, including system setup, device configuration, and system functionality by way of a web conference.
- .11 Onsite commissioning service: system training, system setup, validation of device configuration and system functionality, verification of device network connections, and device installation training.
- .12 Onsite installation and commissioning service: system training, configuration, validation of device configuration, training on system functionality, verification of device network connections, and device installation.
- .13 **CLEANING**
 - .1 Prior to final acceptance, clean exposed surfaces of devices, using cleaning methods recommended by Manufacturer.
 - .2 Perform cleanup as work progresses and leave the work area clean at the end of each day.
- .14 **DEMONSTRATION**
 - .1 Initial Demonstration: provide a demonstration to identified OWNER facility staff that is responsible to maintain the system.

- .2 Demonstrate maintenance procedures for system devices.
- .3 Demonstrate the system features, including monitoring and management of system devices.
- .15 **PROTECTION**
 - .1 Protect finished installation until the final project acceptance.
 - .2 Repair damage to adjacent materials caused by the system installation.
- 3.3 **CLOCKS:**
 - .1 Do not install clocks until painting and other finish work in each room is complete.
 - .2 Locate clocks 450 mm (18 in) below finished ceiling unless indicated otherwise.
 - .3 Provide a deep recessed receptacle at each clock.
 - .4 Provide new batteries in battery powered clocks.
 - .5 Set clocks to correct time, time zone, Standard/Daylight Savings Time and date.
 - .6 Adjust the display brightness of each digital and combination clock to suit both daytime and nighttime illumination levels, to the satisfaction of the Owner.
 - .7 Prior to final acceptance, clean exposed surfaces of clocks, using cleaning methods recommended by clock manufacturer.
- 3.4 **WIRING**
 - .1 Provide wiring as required for a complete, fully operating system.
 - .2 Provide wiring in accordance with the recommendations of the clock system manufacturer.
 - .3 Install wiring in conduit.
- 3.5 **TESTING**
 - .1 Conduct complete testing of the system to verify:
 - .1 operation during loss of power,
 - .2 operation on generator power,
 - .3 ability to correct secondary clocks,
 - .4 ability to restore correct time following loss and restoration of power,
 - .5 Daylight Saving Time adjustment,
 - .6 time zone adjustment.
 - .2 Submit a written report, identifying the results of the above tests and certifying that the system has been installed correctly and is functioning correctly.
 - .3 Assist the manufacturer in conducting the manufacturer's verification of the system. Submit a written report, prepared by the system manufacturer, identifying the verification results and certifying that the system has been installed in accordance with the manufacturer's recommendations.

3.6 **TRAINING**

- .1 Provide the Owner's staff with complete training in the operation and maintenance of the system and it's components. Allow for two separate (repeat) sessions so that all of the Owner's facility personnel can attend.

END OF SECTION

**3RD PARTY FIRE ALARM VERIFICATION
28 08 15**

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.
- .2 Conform to Section 26 05 01, Electrical General Requirements.

1.2 WORK INCLUDED

- .1 The Division 26 contractor shall retain and pay for the services of an Independent 3rd Party Fire Alarm Verification Specialist Firm to provide Fire Alarm and Emergency Voice and Communications System Inspection and Verification services in accordance with the details specified herein. This does not eliminate the requirement for the Fire Alarm System manufacturer to perform testing and verification as part of their scope of work as indicated in Section 28 31 19 - Addressable Fire Alarm System.
- .2 The Division 26 Contractor shall include in the Bid Amount the cost for the services of tradesmen to handle equipment, make temporary connections, operate equipment and make repairs and adjustments and assist the verification organization's on-site specialists during the on-site inspection, testing, and verification phase of the work.
- .3 The Bidders for Division 26 work shall advise all fire alarm equipment suppliers bidding for the equipment supply for this project prior to Bid close of the requirement for comprehensive 3rd party verification and ensure the services and associated costs on the part of the fire alarm equipment supplier are included in the suppliers' quotations for the project and in the Division 26 bid amount.
- .4 The Owner Fire Prevention Coordinator will also be involved to witness Verification. Contractor to co-ordinate with Owner.

1.3 GENERAL SCOPE

- .1 Witness and provide 3rd party verification of the Fire Alarm, Emergency Voice Communication System, and submit completed typed copies of inspection record sheets as described herein. Ensure that the complete system is left fully functioning.
- .2 Provide adequate qualified technicians to witness the complete system verification being performed under the Div 16 contract in accordance with the Division 26 contractor's schedule. Provide any necessary equipment, test apparatus, ladders and scaffolding as required.
- .3 The Fire Alarm & Emergency Voice Communication System supplier will undertake testing and verification of their system in accordance with applicable standards and the Authorities Having Jurisdiction over the project.

1.4 VERIFICATION REPORTS

- .1 Submit verification reports in accordance with Section 26 05 01 Electrical General Requirements.

1.5 **ACCEPTABLE AGENCIES FOR INDEPENDENT 3RD PARTY WITNESS OF TESTING AND VERIFICATION.**

- .1 The firm selected for the independent 3rd party witnessing of the testing and verification of the Fire Alarm, Emergency Voice Communication System shall be suitably recognized by the Professional Engineers of Ontario. Completed copies of reports shall be submitted directly to the Consultant as well as part of the requirements for shop drawings/data books
- .2 The independent agency shall act as an independent witness on behalf of the Owner of the complete testing and verification of the fire alarm system.

Standard of Acceptance

- ° Insta Tech (416 565-6762)

PART - 2 SCOPE OF WORK

2.1 **GENERAL**

- .1 System verification shall be in accordance with the current CAN/ULC-S537" Standard for the Verification of Fire Alarm System". On completion of the verification, the witnessing agency shall submit directly to the Owner one signed certificate together with detailed inspection record sheets outlining location of each system, item, device and certification of the test results per unit. The certificate must clearly confirm that the system is installed, supervised and operates in accordance with the Project Specification and applicable Codes and Regulations.

2.2 **SYSTEM VERIFICATION**

- .1 Make a detailed inspection of all components installed for the Fire Alarm, Emergency Voice Communication System to ensure the following:
 - .1 The completed installation is in accordance with:
 - (a) Project Specification and Drawings
 - (b) ULC requirements
 - (c) Manufacturer's recommendations and guidelines
 - .2 Wiring has been inspected at each device and that wire type, gauge and colour coding are in accordance with the Project Specification.
 - .3 Each manual pullstation, thermal detector, smoke detector, sprinkler flow switch, sprinkler supervisory switch and signalling device are in compliance with the ULC Standards, and that the installation details are in accordance with CAN/ULC-S524.
 - (a) each and every device has been inspected for apparent damage which may interfere with its operation
 - (b) every device has been tested for alarm situation and trouble initiation and circuit polarity
 - (c) the emergency firefighter's telephones have been tested and that two-way voice communication is clear and audible, and that indications at Communication Centre and applicable local control panels are correct.
 - (d) adjacent EVAC speakers have been connected to alternate circuits and that speakers are properly zoned.

- (e) each zone has been tested for remote bypass "Activation" and "Restoration" from the fire alarm video terminal in the power plant.
- .4 The most remote device on each circuit receives operating power. Also confirm that replaceable over-current protection devices are inspected for proper rating. Where new devices (i.e. door holders, magnetic locks, fan shutdown relay, EVAC speakers) are added to the circuit, ammeter load readings are taken and recorded for that circuit.
- .5 Non-damaging tests shall be applied to all the new smoke detector(s) and rate of rise heat detector(s) to activate an alarm in the Communication Centre. In the event that new smoke detectors, heat detectors or pullstations are added to an existing zone, apply simulated test to one randomly-picked existing device in the same zone. Verify printout of the alarm on the Video terminal printer.
- .6 Each alarm and trouble initiating device properly activates the Fire Alarm System such that the Communication Centre and all Annunciator Panels indicate the Zone(s) and the building from which the alarm or trouble originated. The zone description shall match the assigned zoning schedule.

PART - 3 EXECUTION

3.1 REPORTS

- .1 Prepare and submit the following reports. Simultaneously submit one copy directly to the engineer and a further 6 copies to the contractor to be processed as a shop drawing:
 - .1 Site Verification Report for each area requiring partial occupancy within 5 working days of completion of site test.
 - .2 Site verification report(s) reflecting each significant phase of system completion.
- .2 Complete and submit in binder form 6 copies of detailed inspection sheets including Appendix "C", Items "C1", "C2", "C3", "C4", "C5", "C6" and "C7" of the CAN/ULC-S537-97 Standard. In lieu of the ULC Appendix "C", the Verification Agent's own Standard forms, together with the completed Fire Alarm and Voice communication System Verification Report Summary will be accepted if in a comparable format. Information must be clearly defined and legible.
- .3 Completed reports shall also be included as part of the project maintenance manuals / data books.

END OF SECTION

SECURITY CCTV SYSTEM

28 23 01

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1.
- .2 Conform to Electrical General Requirements

1.2 WORK INCLUDED

- .1 **The Hospital currently have, and it is the Scope of this Project to expand the existing, Central CCTV System Network and Network Video Recording/ Monitoring System. The expansion involved in this project are as follows:**

- **'Cat 6' Cabling from new Cameras and Monitors to Security System "Hub" terminated in 'Cat 6' Jacks at both ends**
- **Cat 6 Patch Cables, as required**
- **Installation must implement latest Avigilon Platform and must include integration of the new Cameras/ Monitors into the existing System. It is imperative that the new CCTV Cameras be integrated into the now fully functional Avigilon CCTV NVAR "Cluster" installed in the existing Security Server Room CB-11**

Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete CCTV systems as shown, as specified and as otherwise required. Electrical Contractor shall ensure complete systems shall be left ready for continuous and efficient satisfactory operation.

Details of Typical Camera Network Cabling, Network Racks, Patch Panels (Cat 6 and Fibre), UPS System, Patch Cables, etc. shall be as specified in Section 28 15 00.

- .2 The system, including all components and appurtenances, shall be configured and installed to yield a mean time between failure (MTBF) of at least 10,000 hours, and shall be calculated based on the configuration specified.
- .3 Provide equipment, wiring and other materials for a complete and operational closed circuit television (CCTV) system. The system shall be modular and expandable as herein specified or as the Owner may direct up to full system capacity.
- .4 The system shall consist of state-of-the-art, IP Based programmable dome cameras, various lens sizes, mounts, housings, associated controls.
- .5 Provide low voltage power supplies where required.
- .6 Provide line extending equipment for long distance cabling in Network Based applications.
- .7 Provide suitable low voltage power and connect signal wiring to suit manufacturers' recommendations.
- .8 Provide and test for proper operation, a colour low light level security CCTV system to include focus, resolution and signal level.

- .9 The CCTV system is intended to give clear views of both the site and any one individual, such that the security department can use the video for recognition purposes. The lens shall be chosen by the contractor, in order to achieve the proper result.

1.3 **SYSTEM SUPPLIER**

- .1 The entire CCTV System shall be fully compatible with connection, monitoring and recording via the Avigilon™ Server Hardware and Storage Expansions Model 10.0TB-HD-NVR2 supplied, installed and commissioned by a certified experienced Security Contractor acting as a Sub Contractor to this Division. The approved Security Sub Contractor shall be:

OHM Security LTD
Attn: Andrew Browne
Phone: 905-299-8255
Email: andrew.browne@ohmsecurity.com

1.4 **CCTV INTEGRATION REQUIREMENTS**

- .1 The CCTV Contractor shall be included as part of this project and will be certified in the solution provided as per this specification.
- .2 Provide SDK for CCTV video management system that will enable access control events to cause the change in the recording frame rate of the associated CCTV views. The system shall automatically select and present ready for operator review of the recording of the associated CCTV views for a pre-selected time window prior to the event and after the event.
- .3 The selected and alarm events on the system shall cause immediate security staff notification. On the CCTV system they shall initiate change in the recording frame rate of the associated CCTV views and the security system shall automatically select and present ready for operator review of the recording of the associated CCTV views for a pre-selected time window prior to the event and after the event.
- .4 The video surveillance System shall be interfaced to the Access Control system such that selected Physical Access Control events shall cause the associated video surveillance camera(s) view(s) to be called up on a specified monitor at specified operator station(s). Access Control system is Keyscan.
- .5 The Video Management System shall integrate with Networked Digital Video Recording system.
- .6 This contractor will be responsible to work with the Sunnybrook Project Manager to deliver the required solution. This will include working with Sunnybrook IT Department, to implement and onboard the solution on to the Security VLAN Network.
- .7 The successful proponent will be required to attend all project meetings along with any conference call and/or meetings with Sunnybrook IT department to facilitate the solution through the onboarding process. This contractor shall produce and distribute minutes of meetings.
- .8 This will include but not limited to providing system requirements any antivirus and firewall port exceptions. They will also be required to populate and complete all Sunnybrook Forms and Sunnybrook collaboration sheets to complete the above denoted tasks.
- .9 The Contractor shall attend meetings with an Owner representative and key staff to identify the specifics of the system programming and integration into Sunnybrook's Security VLAN Network.

- .10 The Contractor shall be responsible to record all decisions and parameters discussed during these meetings. The Contractor shall submit in a document all configurations, parameters and receive approval for all programming parameters prior to implementation.
 - .11 The Contractor shall ensure that the operation of the system matches and meets the programming requirements determined in the pre-installation meetings.
- 1.5 **QUALITY ASSURANCE**
- .1 The entire closed circuit television system shall be designed in accordance with and conform to the requirements of:
 - .1 Canadian Standards Association (CSA)
 - .2 Ontario Hydro Safety Code
 - .3 Underwriters' Laboratories Canada (ULC)
 - .4 Provincial and Local Bylaws and Regulations
- 1.6 **SHOP DRAWINGS**
- .1 Submit complete sets of shop drawings following an award of order. Shop drawings shall include copies of dimensional drawings completely describing installation that will be performed with relation to the space available for installation.
 - .2 Part of the shop drawings submittals shall be a Functional Design Manual and Technical Data Package.
 - .1 The functional design manual shall identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions.
 - .2 A description of hardware and software functions, interfaces, and requirements shall be included for all system operating modes.
 - .3 The Contractor shall prepare Technical Data Package with test procedures and reports for the performance verification test and the endurance test.
 - .4 The contractor shall provide a report detailing the results of the field test and a video tape as specified in paragraph Contractor's Field Testing." The final performance verification and endurance test report shall be delivered after completion of the tests.
- 1.7 **MANUFACTURERS' DATA**
- .1 Submit data in the form of catalogue cuts or special data sheets as prepared by the manufacturer.
- 1.8 **OPERATION AND MAINTENANCE MANUALS**
- .1 Submit copies of parts, lists and preventive maintenance requirements for systems to be installed.
 - .2 A draft copy of the operation and maintenance manuals shall be delivered to the Owner's prior to beginning the performance verification test for use during site testing.

- .3 The maintenance manual shall describe maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

1.9 **OPERATOR'S MANUAL**

- .1 The operator's manual shall explain all procedures and instructions for operation of the system:

- .1 Cameras equipment
- .2 Use of the software
- .3 Operator commands
- .4 System start-up and shut-down procedures
- .5 Recovery and restart procedures
- .6 Hardware Manual

- .2 A manual shall describe all equipment furnished, including:

- .1 General hardware description and specifications.
- .2 Installation and checkout procedures.
- .3 Equipment electrical schematics and layout drawings
- .4 System schematics and wiring lists
- .5 System setup procedures
- .6 Manufacturer's repair parts list indicating sources of supply
- .7 Interface definition

1.10 **DEVIATIONS**

- .1 The approval of shop drawings by the Consultant shall not relieve the installer from responsibility for deviation from drawings or the specifications unless he has called attention in writing to such deviations at the time of submission and has obtained the approval of the Consultant thereon. When such deviations are called to the Consultants attention, and no mention is made of extra cost, it will be assumed that any proposed change will be made at no extra cost to the Owner.

1.11 **SUBSTITUTIONS**

- .1 The intent of these Specifications is to establish the quality of the materials and/or workmanship desired for this project. Substitutions shall be in conformance with the requirements as indicated.

1.12 **CCTV SYSTEM TECHNICAL DATA PACKAGE**

- .1 The data package shall include the following:
 - .1 System block diagram
 - .2 Security center CCTV equipment installation, interconnection with equipment, block diagrams and wiring diagrams

- .3 Camera wiring and installation drawings.
- .4 Surge protection device installation.
- .5 Final copies of each of the manufacturer's commercial manuals arranged as specified bound in hardback, loose-leaf binders, shall be delivered to the Owner's within 30 days after completing the endurance test.
- .6 The draft copy used during site testing shall be updated prior to final delivery of the manuals. Each manual's contents shall be identified on the cover.
- .7 The manual shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and nearest service representatives for each item of equipment for each system.
- .8 The manuals shall have a table of contents and tab sheets.
- .9 Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix.
- .10 The final copies delivered after completion of the endurance test shall include all modifications made during installation, checkout, and acceptance.
- .11 The number of copies of each manual to be delivered shall be as specified.

1.13 **WARRANTY, MAINTENANCE, TESTING AND CERTIFICATION**

- .1 Warranty servicing shall be provided for a one (1) year period commencing at system acceptance. This service shall include:
 - .1 Maintenance service as required during or after regular working hours during warranty period
 - .2 Replacing defective parts and components as required.
 - .3 Servicing by factory trained and employed service representatives of the equipment manufacturer.
 - .4 Maintenance of system programming.
- .2 Servicing and maintenance of the CCTV system shall be performed by qualified technicians in regular employment.

1.14 **OPERATION**

- .1 Performance of scheduled adjustments and repair shall verify operation of the CCTV system as demonstrated by the applicable portions of the performance verification test.

1.15 **SYSTEM MODIFICATIONS**

- .1 The Contractor shall make any recommendations for system modification in writing to the Owner's.
- .2 No system modifications, including operating parameters and control settings, shall be made without prior approval of the Owner's.
- .3 Any modifications made to the systems shall be incorporated into the operations and maintenance manuals, and other documentation affected.

1.16 **PRODUCT INSTALLATION AND HANDLING**

- .1 Before and during installation care must be exercised to prevent damage to the sensitive parts and components of the system and be responsible for the storage and handling of all components until acceptance of the completed installation.

1.17 **DEFINITIONS**

- .1 Bridging: Connecting two electrical circuits in parallel.
- .2 Brightness: The attribute of visual perception in accordance with which an area appears to emit more or less light.
- .3 Burned-in Image: An image which persists in a fixed position in the output signal of a camera after the camera has been turned to a different scene.
- .4 CCTV: Abbreviation for closed circuit television.
- .5 Contrast: the range of difference between light and dark values in a picture.
- .6 Depth of Field: The in-focus range of a lens or optical system.
- .7 ESS-Electronic Security System
- .8 Environment-Resistant: General term meaning capable of operating in extremes of temperature, humidity, vibration and dust.
- .9 Footcandle: The illuminance at a surface, all points of which are at a distance of one foot from a uniform source of one candela.
- .10 Iris: An adjustable aperture built into a camera lens to control the amount of light passing through the lens.
- .11 Monitor: a Device for viewing TV connected directly to the camera output.
- .12 Pan and Tilt: The capability which allows a camera to be moved in both the azimuth (pan) and in the vertical (tilt) plane.
- .13 Scanning: Moving the electron beam of an image pickup tube diagonally across the target or screen area of a tube.
- .14 Sensitivity: A factor expressing the incident illumination on a scene required to produce a specified picture signal at the output terminals of a television camera.
- .15 SIT (Silicon Intensifier Target): Trade names for a TV image pickup tube of the direct read out type designed for low light applications.
- .16 CCD: A solid state cameras, charged coupled devices.
- .17 Zoom: To enlarge or reduce the size of a televised image.

1.18 **REQUIREMENTS**

- .1 The CCTV system shall consist of IP Based Type colour format cameras, lens, housings, mounts, controls, cable interface equipment any necessary auxiliary devices for a complete operating system.
- .2 The closed circuit television system shall be synchronized to eliminate vertical roll and jitter when cameras are being switched.
- .3 The signal input level from all cameras to the CCTV switcher system shall be minimum 1 volt peak to peak with equalization (flat) to 5 MHz.

- .4 System shall be provided to prevent ground loop interference.
- .5 Drawings and Specifications: Exact locations of all items shall be determined by reference to the general plans and measurements of the building and shall be subject to the approval of the Consultant.
- .6 The Consultant reserves the right to make any reasonable change in the location of any part of this work without additional cost to the Owner.
- .7 Should any change be deemed necessary by the installer to the proposed contract drawings, the shop drawings, descriptions and the reason for the proposed changes shall be submitted for approval.

PART - 2 PRODUCTS

2.1 GENERAL

- .1 All system hardware components shall be produced by manufacturers regularly engaged in the production of CCTV equipment.
- .2 Units of the same type of equipment shall be products of a single manufacturer.
- .3 All material and equipment shall be new and currently in production.
- .4 Each major component of equipment shall have the manufacturer's name address, and the model and serial number in a conspicuous place.

2.2 COLOUR CAMERAS

- .1 Camera shall transmit images over over 100BASE-TX using advanced H. 264 or MPEG 4 compression technology to achieve the lowest network bandwidth and most efficient image storage. Where required, the data will be converted from PoE+ to fibre. The camera shall be a High-resolution with 2.6-6 mm variable focal auto iris lens mounted in a high impact vandal resistant housing.
- .2 **Acceptable Camera Manufacturer (must be compatible with the Avigilon System)**
 - .1 **Mobotix**
 - .3 Signal-to-noise ratio shall not be less than 50 dB unweighted.
 - .4 The camera shall exhibit no geometric distortion.
 - .5 The lenses shall be integral to the camera block and feature vari-focal length and auto iris
 - .6 The camera shall operate from 10 to 50 degrees C without auxiliary heating or cooling, and with no change in picture quality or resolution.
 - .7 The camera shall operate on 60 Hz AC power, and shall be capable of operating at a voltage of 120 or 24 Volts.
 - .8 The camera shall have a solid state imaging array, and the picture produced by the camera shall be free of blemishes as defined by EIA 330.
 - .9 The camera shall provide not less than 480 lines of horizontal resolution, and resolution shall not vary over the life of the camera.
 - .10 The imager shall have at least 768 horizontal x 494 vertical active picture elements.

.11 Sensitivity

- .1 The camera shall be a high-resolution color 1/4" CCD type with 480 lines of resolution and light sensitivity at F1.4 of 3.0 lux at 50 IRE and 0.4 lux at 20 IRE

.12 Camera Synchronization

- .1 The camera shall also have the capability of synchronization by line-locking to the AC power line frequency at the zero crossing point, and shall provide not less than plus or minus 90 degrees of vertical phase adjustment.

.13 Connectors

- .1 Cameras with lenses having auto iris, manual iris, or zoom and focus functions shall be supplied with connectors and wiring as needed to operate the lens functions.
- .2 Video signal output connector shall be a BNC.
- .3 Cameras with integral fiber optic video transmitters shall have straight-tip bayonet type fiber optic video output connectors.
- .4 Connector shall be provided for external sync input.

.14 Automatic Circuits

- .1 The camera shall have circuitry for through the lens (TTL) white balancing, fixed white balancing, and automatic gain control.

2.3 **CAMERA HOUSINGS AND MOUNTS**

.1 Provide adequate camera housing and mounts to accommodate adequate protection and installations of CCTV cameras:

- .1 The camera and lens shall be enclosed in a tamper resistant housing as specified below.
- .2 Any ancillary housing mounting hardware needed to install the housing at the camera location shall be provided as part of the housing.
- .3 The camera and lens contained in a camera housing shall be installed on a camera support using manufacturer recommended procedures.
- .4 Any ancillary mounting hardware needed to install the support and to install the camera on the support shall be provided as part of the support.

2.4 **GROUND ISOLATION TRANSFORMER**

.1 Provide necessary ground isolation transformers and other components to prevent ground loop interference.

.2 Ground Loop Corrector

- .1 The ground loop corrector shall eliminate the measured ground loop Interference (common mode voltage) in wireline or coaxial video transmission lines.
- .2 The ground loop corrector shall pass the full transmitted video bandwidth with no signal attenuation or loss.
- .3 Clamping ground loop correctors shall be capable of rejecting at least an 8 volt

peak-to-peak 60 Hz common mode signal.

- .4 Ground isolation transformers shall be capable of rejecting at least a 10 volt peak-to-peak 60 Hz common mode signal.
- .5 Ground isolation amplifiers shall be capable of rejecting at least a 30 volt peak-to-peak 60 Hz common mode signal.
- .6 Differential ground loop correctors shall be capable of rejecting at least a 100 volt peak-to-peak 60 Hz common mode signal.
- .3 All wire and cable components shall be able to withstand the environment the wire or cable is installed in for a minimum of 20 years.
- .4 Twisted pair low voltage control wiring to be used above ground or as direct burial cable shall be provided as described in Section 16792. Plenum or riser cables shall be IEEE C2 CL2P certified.

2.5 **DIGITAL DATA INTERCONNECTION WIRING**

- .1 Interconnecting cables carrying digital data between equipment located at the security center or at a secondary control/monitoring site shall be not less than 20 AWG and shall be stranded copper wire for each conductor.
- .2 The cable or each individual conductor within the cable shall have a shield that provides 100 percent coverage.
- .3 Cables with a single overall shield shall have a tinned copper shield drain wire.
- .4 Plenum or riser cables shall be IEEE C2 CL2P certified.

2.6 **CAMERA POWER SUPPLIES**

- .1 Provide camera power supplies as required. Camera power supplies to be CSA approved or to have special Hydro approval. Power supplies to have 24VAC output/120VAC input, individually fused outputs, and a cabinet with suitable lock.
- .2 Representative units to be #ALTV2416-ULX Video Camera Power Supply for 16 cameras and #ALTV248-UL Video Camera Power Supply for up to 8 cameras.

2.7 **“POWER OVER INTERNET” NETWORK SWITCH**

- .1 Provide “Power over Internet” Network Switches, Rack mountable type as required for the System Network connections. Switches shall have adequate power capacity for the ultimate number of connected devices, shall be IEEE.802.3af compliant with adequate 10/100 PoE Ports as required plus minimum 4 spares.
- .2 **Network Switches and associated Service requirements to be purchased from:**
TELUS Enterprise Solutions
Contact: Michele K House, Sales Specialist
(416)-999-6109
michele.house@telus.com

Switches shall be 1u and be as manufactured by CISCO as follows:

CATALYST 9300 48-PORT POE+ NETWORK ESSENTIALS	C9300-48P-E
SOLN SUPP 8X5XNBD CATALYST 9300 48-PORT POE+ NETWORK ESSE	CON-SSSNT-C93004PE
C9300 NETWORK ESSENTIALS 48-PORT LICENSE	C9300-NW-E-48
NORTH AMERICA AC TYPE A POWER CABLE	CAB-TA-NA
50CM TYPE 1 STACKING CABLE	STACK-T1-50CM
CATALYST 3750X STACK POWER CABLE 30 CM	CAB-SPWR-30CM
C9300 DNA ESSENTIALS 48- PORT TERM LICENSES	C9300-DNA-E-48
C9300 DNA ESSENTIALS 48- PORT 3 YEAR TERM LICENSE	C9300-DNA-E-48-3Y
715W AC CONFIG 1 POWER SUPPLY	PWR-C1-715WAC
Catalyst 9300 8 x 10GE Network Module	C9300-NM-8X
NO SECONDARY POWER SUPPLY SELECTED	C9300-SPS-NONE
UA POWER SUPPLY BLANK	PWR-C1-BLANK
CAT9300 UNIVERSAL IMAGE	S9300UK9-166

.3 Service to be provided by Telus

Service Description	Service Code	Minimum Hours
Site: Main Site		
System: CCTV System		
Stand-alone rtr/sw or First switch in a stack (static routes, RIP, no QOS)	NENG	4.00

Stand-alone rtr/sw or First switch in a stack (static routes, RIP, no QOS)	NICD	2.00
Technical Project Management REG	NIMPMR	1.00
Stand-alone rtr/sw or First switch in a stack (static routes, RIP, no QOS)	NISOL	1.00

2.8 **UPS SYSTEM**

- .1 Security System Network UPS Systems should be 3kVA, 120 volt Nominal, Eaton #SPX-3000RT-2U complete with Network-MS Monitoring xx and #EHBPL-3000R-PDUIU 'Hot Swap Bypass' component (See also attached cut sheet)

PART - 3 EXECUTION

3.1 **INSTALLATION**

- .1 Provide CCTV system as shown on Drawings and as specified.
- .2 The Contractor shall install all system components including Owner's furnished equipment, and appurtenances in accordance with the manufacturer's instructions, IEEE C2 and as shown, and shall furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.
- .3 Raceways shall be furnished and installed as specified in Electrical General Requirements, Cabletroughs, Wire & Cables 1-1000 Volts, and Splitters, Junction and Pull Boxes, Cabinets.
- .4 DTM shall not be pulled into conduits or placed in raceways, compartments, outlet boxes, junction boxes, or similar fittings with other building wiring.
- .5 All other electrical work shall be as specified in the above sections including grounding to preclude ground loops, noise, and surges from adversely affecting system operation.
- .6 Provide wiring as required.
- .7 Provide power and signal at cameras as required.
- .8 Install all equipment in accordance with manufacturers' instructions.
- .9 Provide necessary mounting accessories.
- .10 Mount cameras in enclosures on ceilings as per Drawings. Provide suitable power and signal wiring to suit a manufacturer. Selected enclosure must be suitable for each camera location.
- .11 Test each camera output on monitors in the presence of the Consultant to finalize the selection of lenses for cameras.

- .12 Test each system component and feature to prove the system performance and response under normal conditions.
- .13 Test each system component and feature to prove the system performance and response under normal conditions.
- .14 Provide all system wiring in conduits.
- .15 All video cables to be adequately shielded and are not to be run with power cables in same conduits.
- .16 Provide necessary corrective circuitry to accommodate location of CCTV cabling in close proximity to high voltage cabling.
- .17 Install security equipment in the main security office as shown and as specified and install, connect and test all components for a complete operating system.
- .18 Connect all CCTV cameras and control equipment in the building to the same phase in all lighting and receptacle panels.

3.2 **CAMERAS**

- .1 Install:
 - .1 the cameras with the proper focal length lens as indicated for each zone;
 - .2 connect power and signal lines to the camera;
 - .3 set cameras with fixed iris lenses to the proper f-stop to give full video level;
 - .4 aim camera to give field of view as needed to cover the alarm zone;
 - .5 synchronize all cameras so the picture does not roll on the monitor when cameras are selected.
- .2 Dome cameras shall have all preset positions defined and installed.
- .3 Calibrate and test all equipment, verify operation, place the integrated system in service, and test the integrated system.
- .4 Deliver a report describing results of functional tests, diagnostics, and calibrations including written certification to the Owner's that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing.
- .5 The report shall also include a copy of the approved performance verification test procedure.
- .6 Note any objects in the field of view that might produce highlights that could cause camera blinding.
- .7 Note any objects in the field of view or anomalies in the terrain which may cause blind spots.
- .8 Note if a camera cannot be aimed to cover the zone and exclude the rising or setting sun from the picture.
- .9 Note night assessment capabilities and whether lights or vehicle headlights cause blooming or picture degradation.

- .10 If any of the above conditions or other conditions exist that cause picture degradation or interfere with the camera field of view, inform the project manager.
- .11 Provide the Owner's with the digital media record as part of the documentation of the system and shall submit a letter certifying that the CCTV system is ready for performance verification testing.

3.3 **TESTING**

- .1 The field testing shall as a minimum include:
 - .1 Verification that the video transmission system and any signal or control cabling have been installed, tested, and approved as specified.
 - .2 All software functions shall be exercised.
 - .3 Verification that all video sources and video outputs provide a full bandwidth signal that complies with EIA 170 at all video inputs.
 - .4 Verification that all video signals are terminated properly.
 - .5 Verification that all cameras are aimed and focused properly.
 - .6 The Contractor shall conduct a walk test of the area covered by each camera to verify the field of view.
 - .7 When dome camera mounts are used in the system, verify that all preset positions are correct and that the dome also operates correctly in a manual control mode.
 - .8 Deliver a report describing results of functional tests, diagnostics, and calibrations including written certification to the Owner's that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing.
 - .9 The report shall also include a copy of the approved performance verification test procedure.

END OF SECTION

ACCESS CONTROL SYSTEM

28 23 10

PART - 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Conform to Sections of Division 1 as applicable.
- .2 Conform to Electrical General Requirements.
- .3 Materials and equipment described in each Section of the Specification are designed to establish standards of construction and workmanship.
 - .1 Where manufacturers or manufacturers products are identified in lists with phrase "Standard of Acceptance", these are manufacturers and/or products which meet standards with regard to performance, quality of material and workmanship
 - .2 Manufacturers and or products used are to be chosen from these lists.
 - .3 Where the Specification states "to match existing Hospital Standards" it is mandatory that the existing Standard be maintained and that the product must be as manufactured the identified manufacturer and must be the product identified. Quality Assurance.

1.2 WORK INCLUDED

- .1 The Access Control, Security Systems involved in this project are as follows:
 - Key-Scan System serving the Hospital Campus
- .2 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete Access Control, Security Systems as shown, as specified and as otherwise required. Complete systems shall be left ready for continuous and efficient satisfactory operation.
- .3 Provide equipment, wiring and other materials for a complete and operational Access Control, Security System. The system shall be modular and expandable as herein specified or as the Owner may direct up to full system capacity.
- .4 The system shall consist of state-of-the-art controls.
- .5 Provide low voltage power supplies where required.
- .6 Provide all required mounting hardware and brackets.
- .7 Provide suitable low voltage power and connect signal wiring to suit manufacturers' recommendations.
- .8 Provide and test for proper operation.

1.3 **“KEY-SCAN” ACCESS CONTROL, SECURITY SYSTEM SUPPLIER**

- .1 The “Key-Scan” Access Control, Security System, to serve the new areas, shall be supplied, installed and commissioned by the following approved Security Contractor acting as a Sub Contractor to this Division. The approved Security Sub Contractor shall be:

OHM Security LTD
Attn: Andrew Browne
Phone: 905-299-8255
Email: andrew.browne@ohmsecurity.com

1.4 **QUALITY ASSURANCE**

- .1 The Access Control, Security Systems shall be designed in accordance with and conform to the requirements of:

- .1 Canadian Standards Association (CSA)
.2 Electrical Safety Code

1.5 **SUBMITTALS: SUBMITTALS SHALL BE OF ADEQUATE DEPTH TO DEFINE FULLY THE SYSTEM OFFERED.**

- .1 Shop Drawings: Submit complete sets of shop drawings following award of order. Shop drawings shall include copies of dimensional drawings completely describing installation that will be performed with relation to the space available for installation.
- .2 Manufacturer's Data: Submit data in the form of catalogue cuts or special data sheets as prepared by the manufacturer.
- .3 Maintenance Data: Submit copies of parts, lists and preventive maintenance requirements for systems to be installed.
- .4 Training Data: Submit copies of the proposed employee training plan and documentation for the system.

1.6 **PRODUCT INSTALLATION AND HANDLING**

- .1 Before and during installation care must be exercised to prevent damage to the sensitive parts and components of the system and be responsible for the storage and handling of all components until acceptance of the completed installation.

1.7 **WARRANTY:**

- .1 Systems shall include a standard warranty on parts and warranty on labour. Any required system repairs which occur between the date of acceptance by the owners and the one year anniversary shall be provided without cost.
- .2 The supplier shall maintain a service department, necessary spare parts, after hours telephone answering services and call dispatching services required to implement the service standard stated below as part of this contract.

1.8 **1.8 SYSTEM VERIFICATION**

- .1 Test and demonstrate the operation of the complete system to the Owner. This shall include, but not be limited to:
- a) detailed test and demonstration of each operable device

- b) detailed test and demonstration of overall system operation
 - c) interfacing of various components.
- .2 On completion of the installation the manufacturer/supplier shall supply, to the Consultant and Commissioning Agent, a certificate, together with detailed inspection record sheets showing location of each device and certifying the test results per unit, confirming that the system is installed and operates in accordance with Specification.
- 1.9 **SCOPE, "KEY-SCAN" SYSTEM**
- .1 The "Key-Scan" Access Control, Security System installation required for this installation incorporates:
- .1 Card Readers to control entry to doors indicated
 - .2 Electric Strikes and Power Supplies
 - .3 Request to Exit Devices
 - .4 Magnetic locks including Magnetic Lock Permits
 - .5 Door alarm contacts for connection to Central Security System
 - .6 local power supplies as required
 - .7 Wire, conduit and connections to card reader, door alarms, electric strike, magnetic locks on doors and power supplies to controlled doors.
 - .8 Connection to Hospital Network System for connection to Central Security System
 - .9 Integration between the Security System and the CCTV System.
- 1.10 **THE ACCESS CONTROL SYSTEMS SHALL BE USED TO PROVIDE:**
- .1 Access control to the protected doors
 - .2 Whenever a card is read by a card reader/ key-reader, the reader shall check for valid entry in the following manner:
 - .1 The card must be authorized.
 - .2 The priority/access level must match that of the card reader
 - .3 The time must fall within the access schedule for the card reader
 - .3 The information from the card reader shall include provision for transmission the Central Security Computer which shall (activate or deactivate by operator's command) display related information such as card number, employee name, department, reader number, time and date on the card access CRT display terminal. Alarm messages and transactions from assignable readers shall be displayed on the card access CRT display terminal and a hard copy printout initiated on the appropriate printer.
 - .4 If the card is valid, the electric locking devices shall be bypassed for a preset time. The preset bypass time will vary for each access controlled door which will be determined on site.
 - .5 Exit through card access doors shall be by free-exit through motion sensor.
 - .6 If the door is held open longer than the preset time, the door monitoring switch shall initiate an alarm to the Security Computer

- .7 All invalid or unauthorized access attempts or alarm conditions shall initiate an alarm to the future Security Computer.
- .8 All information shall be stored in disk form with the ability to retrieve information on a day, time, card number, employee name or reader number when requested by operator's command.

PART - 2 PRODUCTS

2.1 DOOR MONITORING:

- .1 All doors as indicated on the Drawings shall be monitored
- .2 Each door shall be capable of being monitored in one of three modes:
 - .1 Free access
 - .2 Secure
 - .3 Schedule controlled free access
- .3 Selected (manual override) doors in the building to be manually controlled from the security office. Activation of associated code on the security terminal keyboard will release locking devices and by pass monitor switch.
- .4 Activation of the fire alarm system or power failure shall cause the electro-magnetic locks on exit doors to release. Provide the necessary interconnection with the fire alarm system for system operation.
- .5 The release shall be of the failsafe type ensuring unlocking of doors for any malfunction of the security system or if the fire alarm system alarms. The arrangement shall be on the approval of the local authorities having jurisdiction

2.2 "KEY-SCAN" INTELLIGENT PROXIMITY CARD READERS INCLUDING:

- .1 Fully compatible with cards produced by the Hospital's "IdentiCam" photo card system.
- .2 LCD back-lighted with EL lamp
- .3 Each door shall be considered a separate security alarm point or zone.
- .4 System shall include dry contacts for remote alarms.

2.3 SECURITY SYSTEM COMPUTER SOFTWARE:

- .1 System must be compatible with existing photo imaging system "Identicam".
- .2 Software must have ability to be integrated with the CCTV System.
- .3 Computerized software shall monitor new doors or zones.
- .4 The security system shall up-date/ provide any required automatic display of colour floor plan maps of the building (showing area in alarm) on the graphic CRT display terminal screen.
- .5 An alarm condition shall be displayed on the graphics by a colour code change and the flashing of the standard symbol used to highlight the location of the device which initiated an alarm and identifying the current status of the device.

- .6 Each time a map is displayed, the system shall determine and display the status of the monitored points represented in the map. The system shall be provided with all software and hardware required for an operator to create and maintain maps.
 - .7 The colour graphics display shall identify input circuit conditions such as circuit secure, circuit in alarm, circuit in trouble and circuit manually shunted (ie. difference colour codes). Create maps, with necessary active points including building or area outlines, symbols, stairs, elevators, corridors for areas in which security devices are shown. Mapping data base to be programmed by cursor or other approved method and have the capability of printing maps. Include all menus, charts, and symbols required for total system outline and hardware required to produce the graphics to the Consultant's approval.
- 2.4 **TAMPER OPERATION:**
- .1 Tamper switches shall be provided on all control and equipment cabinets such as card reader controllers. Tamper switches shall include provision for future connection to Security System.
- 2.5 **SUBMITTALS AND INSTRUCTION:**
- .1 The following data shall be forwarded upon award of Contract:
 - .1 cable schematic showing card reader controllers, alarm terminals, card readers, power supply locations and all other devices and associated wiring and power
 - .2 Technical specification data sheets of each system component and device.
 - .2 Provide complete system documentation at acceptance time, as specified herein.
- 2.6 **READER CONTROLLERS:**
- .1 Controllers to be solid state microprocessor based and shall support and communicate with card readers employing a LCD display. The unit shall grant or deny access while including independent reporting system activity back to the CPU for report generation or alarm initiation.
 - .2 Provide battery backup for unit.
 - .3 Provide tamper switch alarmed to security console.
 - .4 The controller shall be capable of operating, connecting and communicating with proximity type readers
- 2.7 **REMOTE ALARM TERMINALS:**
- .1 Provide wall mounted remote data terminals to be microprocessor based housing circuit modules capable of monitoring and connecting to alarm inputs of zones (ie. door monitor, switches, etc.) as required, power supply unit and standby battery.
 - .2 The terminal shall have LED indicators for AC power, alarm and trouble. The unit shall contain automatic self-checking program for processor and memory with self-diagnostics.
 - .3 Each remote terminal shall be loaded to 85% of its capacity with the field zone/point circuits. The remaining 15% capacity of circuit modules shall be used for future connections.
 - .4 Remote terminals shall have a key locked cabinet with tamper switch alarm to the security terminal if located outside of terminal cabinets.
 - .5 Unit to be fed from the nearest emergency power source at 120 V.A.C.

2.8 POWER SUPPLIES:

- .1 Provide all necessary power supplies, 24 volt AC and/or DC including transformer and/or rectifiers required for operation of the system. 120 volt AC power circuits will be connected from the nearest emergency power panel.
- .2 Provide battery back-up to prevent loss of memory and loss of power. UPS system shall be retained for a power outage for a minimum of two (2) hours.
- .3 Power supplies shall be in a separate enclosure, secured with a key lock.

2.9 SYSTEM DEVICES:

- .1 "Key-Scan" Card Readers
 - .1 Provide flush mounted card readers. The card reader shall detect the code information on the card and shall include provision to transmit the information to the "Key-Scan" Central Security System.
 - .2 Card reader shall include an "EL" indicator lamp.
 - .3 The response time shall be within .5 seconds. The reader shall be mounted to any non-metal surface.
 - .4 Power to the reader and data cables shall be connected to the associated card reader controller.
 - .5 The reader shall be vandal-proof, dirt-proof, weatherproof and shock-resistant.
 - .6 Provide a backbox for mounting of card reader.

2.10 CONNECTION TO ELECTRIC DOOR HARDWARE:

- .1 For doors with electric strikes, electric magnetic locks or electric locking devices provide all connections to electric door hardware at a voltage to suit hardware for proper operation.
- .2 Provide transformers and rectifiers for the necessary power supplies (24 volts AC or DC) and sized as required to suit hardware equipment supplied.
- .3 Coordinate with all suppliers of other equipment connected to security system.
- .4 Conduit and wiring will be provided by the Electrical Contractor as specified by the security (card access) system manufacturer.
- .5 The Security System Installer shall provide all door hardware (electric strikes, door monitoring contacts, motion exit device, power supplies etc.) that are to be installed on existing doors.

2.11 DOOR MONITORING SWITCHES:

- .1 Door monitoring switches (ie. magnetic contacts) shall be provided.
- .2 Provide the necessary points, wiring, conduits, boxes, and connections to the door monitoring switches for proper operation. Coordinate connections and installation with the door hardware contractor.

2.12 SECURITY INTERFACING

- .1 Interface the Security System to the CCTV System.

- .2 Security System will receive a dry contact signal from either system to activate the alarm.

2.13 **MISCELLANEOUS REQUIREMENTS**

- .1 Include in the Contract the cost of a qualified technician to test and verify the system and correct all wiring and installation faults. Test and demonstrate the operation of the system to the Owner. This shall include, but not be limited to a detailed test and demonstration of each operable device and a detailed test and demonstration of overall system operation.
- .2 On completion of the installation the manufacturer/supplier shall supply a certificate, together with detailed inspection record sheets showing location of each device and certifying the test results per unit, confirming that the system is installed and operates in accordance with Specification.
- .3 Provide all back boxes and plates, all wire and cable, complete with terminations if necessary and multi-prong female fittings for the complete installation of the intercom stations in the locations shown.

PART - 3 EXECUTION

- .1 Provide "Key-Scan" Access Control, Security Systems as shown on Drawings and as specified.
- .2 Install all equipment in accordance with the manufacturer's instructions.
- .3 Readers shall be installed at least 6" away from metal surfaces.
- .4 Readers to be mounted at 47" above finished floor.
- .5 The manufacturer/supplier it to assist the Contractor in the installation and provide technical expertise required. Make final connections.
- .6 Adjust system components as necessary to ensure complete system operation.

3.2 **WIRING**

- .1 All wiring to be installed in conduit.
- .2 All wiring to be in accordance with manufacturer's recommendations.
- .3 All card access cables to be adequately shielded and are not to be run with power cables in same conduit.

3.3 **SECURITY SYSTEM - WARRANTY, MAINTENANCE, TESTING AND CERTIFICATION**

- .1 Provide Warranty and Training as specified.
- .2 Test all components of the system for proper operation as indicated in Specification.
- .3 Acceptance procedures shall be in accordance with General Requirements and the following:
 - .1 Written certification shall be provided, on completion of a thoroughly tested installation, that the system has been pre-tested and is ready for acceptance testing. Written certification shall consist of a check list of operating features has been pre-tested and is functioning satisfactorily.

END OF SECTION

FIRE ALARM SYSTEM
28 31 13

PART - 1 GENERAL

1.1 GENERAL

- .1 Conform with the requirements of Section 26 05 01 Basic Electrical Requirements.

1.2 PROGRAMMING CHANGES

- .1 Include in the Bid Price for all programming changes required for the duration of the project and as required to obtain final acceptance by the Fire and Building Departments.
- .2 Include in the Bid Price for all costs associated with Up-dating the existing Fire Alarm System Computer Floor Plan Graphics as required by the changes created by this renovation.
- .3 Provide audibility testing of sound levels in each and every room and ensure Code required minimum levels are maintained. Adjust speaker transformer "taps" to ensure minimum/maximum sound levels are maintained. Provide, in the final Verification Report, an indication of the exact sound pressure levels in each room.
- .4 Care shall be taken when placing detectors to ensure that they are not in the direct air stream of a supply air diffuser. However, the preferred location of a smoke detector within any one bay would be in the air stream of a return air diffuser. Ensure smoke detectors are a minimum of 5'-0" from any supply air diffuser.

1.3 RELATED WORK

- .1 Sprinkler systems: Section 21 13 13 Wet Pipe Sprinkler Systems
- .2 Wiring: Section 26 05 19 Wires & Cables 0-1000 Volts
- .3 Conduits: Section 26 05 33 Conduits Fastenings and Fittings
- .4 Access Control System: Section 28 23 10 Access Control System

1.4 REFERENCES - CURRENT EDITION OF

- .1 CAN/ULC-S524 Installation of Fire Alarm Systems
- .2 ULC-S525 Audible Signal Appliances
- .3 CAN/ULC-S527 Control Units
- .4 CAN/ULC-S528 Manual Pull Stations
- .5 CAN/ULC-S529 Smoke Detectors
- .6 CAN/ULC-S530 Heat Actuated Fire Detectors
- .7 CAN/ULC-S536 Inspection and Testing of Fire Alarm Systems
- .8 CAN/ULC-S537 Verification of Fire Alarm Systems
- .9 CAN/ULC-S548 Alarm Initiating and Supervisory Devices for Water Type Extinguishing Systems

- .10 CAN/ULC–S533 Egress Door Securing and Releasing Devices
- .11 CAN/ULC–S542 Speakers for Fire Alarm Systems
- .12 CAN/ULC–S526 Visual Signal Appliances
- 1.5 **REQUIREMENTS REGULATORY AGENCIES**
 - .1 System
 - .1 Ontario Building Code
 - .2 System components: listed by ULC and CSA and complying with applicable provisions of Ontario Building Code, and meeting requirements of local authority having jurisdiction.
- 1.6 **SHOP DRAWINGS**
 - .1 Submit shop drawings in accordance with Section 26 05 01- Electrical General Requirements.
 - .2 Include:
 - .1 Details for devices.
 - .2 Details and performance specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.
 - .3 Battery capacity calculation.
 - .3 The Contractor in co-operation with the supplier of the system shall prepare a detailed riser diagram of the complete system showing all major components, devices and necessary interconnecting wiring.
 - .1 Diagram is to indicate wiring quantities, sizes and colour code and to indicate conduit sizes.
 - .2 Riser Diagram is to be produced on AutoCad and is to be submitted as a Shop Drawing.
 - .3 Riser Diagram is to be revised 'As-Built' at the completion of the project and submitted with Maintenance Manuals (submit both a copy of the Drawing and an AutoCad disc).
- 1.7 **OPERATION AND MAINTENANCE DATA**
 - .1 Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Section 26 05 01 - Electrical General Requirements.
 - .2 Include:
 - .1 Instructions for complete fire alarm system to permit effective operation and maintenance.
 - .2 Technical data - illustrated parts lists with parts catalogue numbers.
 - .3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.
 - .4 Copy of verification certificate, verification report and warranty certificates such as for fire alarm system, batteries, ancillary devices, and other similar items, including battery suppliers date coding for batteries.

1.8 **MAINTENANCE MATERIALS**

- .1 Provide maintenance materials in accordance with Section 26 05 01 - Electrical General Requirements.

1.9 **TRAINING**

- .1 Provide on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

1.10 **WORK INCLUDED:**

- .1 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete Fire Alarm System as shown, as specified and as otherwise required. Complete systems shall be left ready for continuous and efficient satisfactory operation.
- .2 Supply and install an expansion to the existing complete and operating two stage, zoned, fully supervised Fire Alarm System as shown, as specified and as otherwise required.

1.11 **DESCRIPTION OF SYSTEM**

- .1 There exists a two stage, zoned complete and operating Fire Alarm System as supplied by Chubb Edwards. Scope of this renovation requires:
 - .1 Any expansion, modifications to the existing System to incorporate the revised/ added functions shown on the Drawings including:
 - .1 adding new detection, alarm sounding devices, strobe lights
 - .2 adding new Sprinkler and Pre-Action Sprinkler System alarm and supervisory Zones in the renovated as shown on the Drawings
 - .2 Provide new Trouble signal devices, Power supply facilities, Manual alarm stations, Automatic alarm initiating devices, connection to sprinkler system flow devices, connection to supervised valves (trouble signal only), Door release for doors with hold-open devices or magnetic locks, Audible signal devices, End-of-line devices, Visual alarm signal devices, Ancillary devices, Door release for doors with hold-open devices or magnetic locks, Fan shutdown,
- .2 Additional Requirements
 - .1 Necessary circuitry for operation of supervised valves and loss of power alarms for sprinkler system and auxiliary booster or special service pumps.
 - .2 Smoke detectors installed in Operating Rooms shall be Photoelectric/thermal combination with contact to drive the over the door dome light.
 - .3 The smoke detectors in corridors shall be of equal numbers of ionization and photoelectric and alternated along the corridor or be combination type detectors.

1.12 **SYSTEM OPERATION**

- .1 It is the intent to maintain the operation of the existing Fire Alarm System

1.13 SPARE COMPONENTS

- .1 Include in the Bid the following additional components including installation (include an average of 20'0" of wire in conduit for each additional device and connection to an adjacent zone/ circuit). Assume, for bidding purposes, that these devices can be added at any time during construction including at the end of the construction and in any location as directed on site. Any devices not installed shall be turned over to the Hospital:
 - 2 (two) addressable smoke detectors
 - 2 (two) speakers
 - 2 (two) addressable pull stations
 - 2 (two) strobe lights
- .2 Verification and any programming required by the installation of these components shall be included.

PART - 2 PRODUCTS

2.1 INPUT (ALARM INITIATING) CIRCUITS

- .1 Provide alarm receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors, and water flow switches as indicated on schedules.
- .2 Alarm receiving circuits shall be wired in a Class B, 2 wire configuration.
- .3 All alarm receiving circuits shall be supervised for open, short or ground fault conditions by the use of an end of line resistor.

2.2 OUTPUT ALARM CIRCUITS

- .1 Provide alarm output circuits for polarized audible signals such as speakers, horns and visual indicators as indicated.
- .2 Provide necessary amplifiers and tone generator modules for electronic audible alarm devices as required.
- .3 Alarm output circuits shall be wired in a class B, 2 wire configuration.
- .4 All alarm output circuits shall be supervised for open, short or ground fault conditions by the use of an end of line resistor.

2.3 AUXILIARY CIRCUITS

- .1 Provide contacts for fan shut-down as indicated. They shall be of normally closed type. Fan bypass switches shall be provided for each group of fans as indicated and coordinated on site.
- .2 Provide contacts for pressurization system fans. They shall be arranged to start up the fans and shall be of normally closed type. By-pass switch shall be provided as indicated.
- .3 Provide contacts for magnetic door locks and holders. They shall be arranged to release the doors upon actuation of fire alarm system. By-pass switches shall be provided to prevent doors from being released during test of fire alarm system.
- .4 Provide contacts for smoke vents as indicated. They shall be of the normally closed type and shall release all smoke dampers upon actuation of fire alarm system. By-pass switches shall be provided indicated.
- .5 Provide auxiliary contacts with 120 V AC/24 V DC, 2.5 A @ 0.5 power factor rating.

2.4 VOICE COMMUNICATION CIRCUITS

- .1 Provide communication circuits for the 5th & 7th Floors as required
- .2 All communication circuits shall be supervised for open, short or ground fault conditions.
- .3 Amplifiers shall be solid state type compatible with the existing System
- .4 Provide for interconnection to operate the system as specified.

2.5 POWER SUPPLY

- .1 Provide an internal integrated power supplies, including surge suppression and circuitry for the System operation as required.

2.6 MANUAL FIRE ALARM STATIONS

- .1 Manual pull stations shall be metal construction, open circuit, pull lever type and finished in red enamel. They shall be mounted in a 101 mm (4 in) square recessed box with plaster ring in finished areas and surface mounted in unfinished areas.
- .2 Manual stations shall be suitable for insertion of an evacuation key.
- .3 Each pull station shall be provided with an additional auxiliary contact(s) to allow direct connection to future magnetic locks {and for two stage operation}.

2.7 AUTOMATIC FIRE ALARM DETECTORS (HEAT DETECTORS)

- .1 Automatic detectors shall be of the following types:
 - .1 57.2°C (135°F), fixed temperature and -9.4°C (15°F) per minute, rate of rise
 - .2 93.3°C (200°F), fixed temperature only
- .2 Detectors shall have suitable mounting plates with finish ring.

2.8 END OF LINE RESISTORS

- .1 Where Class B wiring is specified or permitted, the end of line resistors shall be located in outlet box with stainless steel cover plate.

2.9 IONIZATION SMOKE DETECTORS

- .1 Ionization type smoke detectors shall be constructed of solid state components and operate on ionization principle to detect visible and/or invisible products of combustion.
- .2 It shall be possible to check and change sensitivity of detectors. Smoke detectors shall be set for approved sensitivity.
- .3 Detectors shall be ULC listed.
- .4 Incorporate an LED or lamp latched circuit to indicate the signal operation of the unit.
- .5 Smoke detectors shall operate on 24 volts DC and be protected against electrical transients and electromagnetic interference.
- .6 Detectors shall be equipped with NO/NC contacts to operate ancillary devices where applicable.
- .7 Detectors shall be equipped with a fine mesh bug screen to prevent contamination of the detection chamber by insects.

- .8 The detector shall be a plug-in/twist lock unit which may be removed from its base with a special installation tool without disconnecting detector wiring.
- .9 The detector shall filter out false alarms caused by intermittent aerosols or cigarette/pipe tobacco smoke.
- .10 Recessed smoke detector shall be complete with necessary shroud and flush mounting hardware.
- .11 Protect automatic smoke detectors during construction with a dust-bag, which shall be removed at the time of verification.

2.10 **PHOTOELECTRIC SMOKE DETECTORS**

- .1 Photoelectric smoke detectors shall operate on the photoelectric (light scattering) principle of operation and be activated by visible or invisible products of combustion. Detectors shall be constructed of solid state components with the infrared light source for the photoelectric sensor emitted from a semiconductor diode.
- .2 Detectors shall be ULC listed.
- .3 Incorporate an LED or lamp latched circuit to indicate the signal operation of the unit.
- .4 Smoke detectors shall operate on 24 volts DC and be protected against electrical transients and electromagnetic interference.
- .5 Detectors shall be equipped with NO/NC contacts to operate ancillary devices where applicable.
- .6 Detectors shall be equipped with a fine mesh bug screen to prevent contamination of the detection chamber by insects.
- .7 The detector shall be a plug-in/twist lock unit which may be removed from its base with a special installation tool without disconnecting detector wiring
- .8 The detector shall filter out false alarms caused by intermittent aerosols or cigarette/pipe tobacco smoke
- .9 Recessed smoke detector shall be complete with necessary shroud and flush mounting hardware.
- .10 Protect automatic smoke detectors during construction with a dust-bag, which shall be removed at the time of verification.

2.11 **DUCT MOUNTED SMOKE DETECTORS**

- .1 Duct-mounted smoke detectors shall consist of an ionization type smoke detector as described above, and an air tight housing assembly, mounted on the side of the duct complete with sampling tubes and supporting framework.
- .2 While fans are running, a continuous cross-sectional sampling of the air flows from the ventilation duct, through the detector, and then returned to the duct. Air stream velocity range from 2.5 m/sec minimum to 18 m/sec maximum be made to monitor, test and reset the detectors under actual air flow conditions. Unit shall be equipped with a test key switch and a reset key switch.
- .3 Remote alarm lamps or LED shall indicate the signal operation of the detector. Install Remote LED in an easily visible location to someone standing on the floor without requiring the use of ladders to see it.

- .4 Protect automatic smoke detectors during construction with a dust-bag, which will be removed at the time of verification.
- .5 Manufacturer shall include site visits to direct detailed locations of duct-mounted smoke detectors.

2.12 PERIPHERAL ALARM INITIATING DEVICES

- .1 Local control panels, interfaced with other equipment such as pre-action systems, kitchen hood extinguishing systems, or other Control panels, shall be a single zone capable of operating on 120 volt AC, 60 Hz and shall be complete with two isolated Form 'C' contacts and capability to initiate a fire alarm signal.
- .2 Manufacturer shall examine drawings and specifications prior to award of contract to ensure that detectors, control panels and miscellaneous devices being supplied will provide a satisfactory working installation.

2.13 ALARM SIGNAL APPLIANCES

- .1 Remote smoke detector alarm lamps shall be mounted in a single gang switch box with a brushed stainless steel cover, screw type terminals and electrically connected to heat or smoke detectors that require remote annunciation. Use only high intensity (200 med) LED lamps.
- .2 Alarm strobe lamps shall be ULC listed and operate on 24 V DC. The strobe shall be able to flash at a rate of one flash per second in alarm mode. The words "FIRE" shall appear on the strobe lens. Strobes shall comply with ADA requirements.

2.14 FIRE ALARM SPEAKERS

- .1 Speakers shall be complete with acoustically treated enclosure, line matching transformer, 203 mm (8 in) diameter, ULC approved permanent magnet type speaker and complete with flat white baked enamel square baffle.
- .2 Speakers shall be flush mounted unless otherwise noted.
- .3 Speakers shall produce a minimum gap flux density of 9500 gauss, have a voice coil impedance of 8 ohms, power rating of 20 watts, RMS according to EIA Standard RS-426A, a uniform frequency range from 80 - 13,000 Hz with minimum axial sensitivity of 94 dB at 4 feet with one watt input. The speakers shall have characteristics to produce a wide dispersion bandwidth in a hemispherical pattern in both horizontal and vertical plane.
- .4 Speakers shall have line matching transformers with 1/4 W, 1/2 W, 1 W and 2 W taps, initially set at 1 W. Verify suitability of sound levels in each area and adjust tap to suit.
- .5 Speaker baffles shall be held in place with approved fasteners.
- .6 Unit shall be complete with hook-up terminals with screw-type connection.
- .7 Speaker enclosures in exterior areas shall be suitable for surface mounting. Speaker enclosures elsewhere shall be suitable for outdoor location.

2.15 RISER DIAGRAM

- .1 The contractor in co-operation with the supplier shall prepare a riser diagram showing all major system components and inter-connecting wiring requirements. Riser to be submitted as a shop drawing.

2.16 **WIRING**

- .1 Wiring shall be as recommended by fire alarm system manufacturer.
- .2 Wiring for speaker circuits shall be twisted pair shielded sized as recommended by the manufacturer and it shall be installed in conduit.
- .3 Wiring within the floor area from detection device to device shall be as recommended by manufacturer, and installed in EMT conduit.
- .4 Provide line isolators where wiring crosses a different fire alarm zone.

2.17 **MATERIALS**

- .1 Fire alarm systems and components shall be:

- Standard of Acceptance*
 - **Chubb Edwards**

PART - 3 EXECUTION

3.1 **INSTALLATION**

- .1 Installation of the Fire Alarm system components shall be in accordance with latest edition and all amendments of CAN/ULC-S524-M91 Standard for the Installation of Fire Alarm Systems.
- .2 The system shall be installed and wired by persons qualified and licenced to perform the installation of fire alarm systems.
- .3 Wire alarm initiating, alarm output, auxiliary output and signal devices to local SCP's as indicated in the schedules.
- .4 Wire alarm initiating circuits. Connect detectors and manual stations. Properly arrange and connect circuit wiring to their respective circuits as shown on the drawings.
- .5 Provide a separate class A addressable Loop for each zone as indicated on the drawings, complete with line isolators where the loop enter the zone.
- .6 Connect the pull stations, smoke detectors, flow switches, valves, zone alarm modules etc. to the addressable loops.
- .7 Install wiring for the alarm signal, alarm initiating and speaker circuits in separate raceways.
- .8 Wire signal circuits alternatively such that no two adjacent signal devices are on the same circuit.
- .9 Arrange wiring to the speakers such that no two adjacent speakers are connected to the same circuit.
- .10 Speakers shall be surface mounted in outdoor spaces.
- .11 Equip all raceways with a separate ground conductor.
- .12 Test each automatic detector to ensure correct wiring and zoning by setting off its rate of rise component and sounding the signals or by ringing it out. Test each smoke detector, sprinkler system and standpipe system valves to ensure correct wiring.

3.2 DOOR HOLDERS/CLOSERS AND MAGNETIC LOCKS

- .1 Connect all door holders into the fire alarm system such that doors close automatically upon actuation of the fire alarm system.
- .2 Connect all magnetic locks so that they are released by the fire alarm system and wire directly to be released by the adjacent pull station on First stage alarm in all area of the hospital except psychiatric areas. Mag locks in psychiatric areas will open on second stage alarm. Confirm this operation with local fire department prior to installation or programming.

3.3 SPRINKLER/STANDPIPE SYSTEM CONNECTIONS

- .1 Connect contacts of sprinkler flow, supervisory and standpipe system switches to fire alarm zones indicated and verify correct zoning.
- .2 Connect contact voltage sensitive relay of sprinkler pump, auxiliary booster or special service pump to fire alarm zone indicated, for trouble condition.

3.4 WIRING

- .1 Install wiring in conduit using wire size and type in accordance with manufacturer's recommendations.
- .2 Connect automatic detectors, smoke detectors and manual stations between red and black conductors at each outlet. Cut red and black conductors at each outlet and connect to terminal screws provided, red to red and black to black.
- .3 Install wiring between fire alarm and each diesel-generator control panel to show "running" and "trouble" indications.
- .4 Arrange wiring between existing and new fire alarm control system to achieve operation as specified.
- .5 Entire installation shall be done under supervision of manufacturer. Upon completion of installation, check entire system to approval and correct any malfunction immediately.

3.5 SYSTEM VERIFICATION

- .1 The fire alarm system shall be verified in accordance to ULC CAN 4-S537 Standard For the Verification Of Fire Alarm Systems.
- .2 The manufacturer of the fire alarm and voice communication system shall make a complete inspection of all components installed for system, such as manual stations, speakers, smoke detectors, annunciators, sprinkler and standpipe valves to ensure the following:
 - .1 That the system is complete in accordance with Specifications.
 - .2 That the system is connected in accordance with Manufacturer's recommendations.
 - .3 That the regulations concerning the supervision of components have been adhered to
 - .4 That all equipment as part of the system is inspected for visible damage or tampering
 - .5 That adjacent speakers have been connected to alternate circuits.
 - .6 That the control functions have been tested for proper supervision, operation and annunciation of fan shutdown and all speaker control circuits

- .7 That all speakers are properly zoned.
 - .8 That all valves are properly connected and displayed correctly on each annunciator.
 - .9 That any subsequent changes necessary to conform to the above will be carried out with technical advice supplied by the Manufacturer.
 - .10 That all thermal detectors, smoke detectors, manual pull stations and all sprinkler system and standpipe system valves have been operated and are in good working order.
 - .11 That all annunciators correctly pin-point the origin of any fire alarm.
 - .12 That actual test gas concentrations of sufficient density, have been applied to each new smoke detector to cause the detector to be set off and that the sensitivity of each smoke detector has been set. On completion of test, a letter shall be forwarded stating that tests have been completed and that system is operating correctly.
 - .13 All tests required by Local Authorities have been carried out and all existing zones have been verified.
- .3 Verification records shall be maintained with the following minimum requirements:
- .1 verification records shall list each device and show the date on which each device was verified and the initials of the person who verified it.
 - .2 verification records shall show the date on which all devices were verified.
 - .3 verification records shall show the date of all deficiencies encountered in the control equipment, wiring and field devices.
 - .4 verification records shall show the date when deficiencies were corrected and re-verified
- .4 Provide any necessary equipment, test apparatus, ladders and scaffolding as required.
- .5 Adjust system and components as required to ensure complete system operation.
- .6 Only after the testing and verification task is completed, and all deficiencies rectified, notify the Engineers and representatives of the Fire Department and demonstrate the proper functioning of the system

END OF SECTION



ICN Cabling Standards Information & Telecommunication Services Revised : January 11, 2017

General Overview

Sunnybrook has an extensive Ethernet network extending throughout four campuses:

1. Sunnybrook (SB) – 2075 Bayview Ave. (north of Eglinton)
2. Holland Centre (HC) – 43 Wellesley St. (east of Yonge)
3. St. John Rehab (SJR) - 285 Cummer Avenue (west of Bayview)
4. CNIB - 1929 Bayview Ave. (north of Eglinton)

There are approximately 74 wiring closets cabled with Cat5/5e/6/6a UTP cables across the four campuses, with the majority of 61 at Sunnybrook campus.

The implementation of an Intelligent Campus Network (ICN) began in 1995 at the SB campus. This involved moving from a token-ring to an ethernet wide facility and included the implementation of new hub rooms, backbone fibre and horizontal UTP cabling installed to Nordx/CDT IBDN certification. Backbone fibre type will be type OM4 MMF or SMF where required. Standard horizontal UTP will be Category 6 with any new construction or large area renovation project.

Majority of the hub rooms have their own dedicated pathway which serves those floors assigned to that specific room. The pathway may be either zone and distribution conduit or a J-hook design.

The telephone infrastructure (Cat3) consists of a riser closet or terminal located in every wing on every floor of our buildings. The majority of our terminals follow the industry BIX standard. Some of our terminals are in shared locations with the ICN network hub rooms.

Scope of Work for Data Cabling

The extent of the MAC work includes but is not limited to the following:

1. Place data cabling in existing horizontal pathway from the offices requiring MAC work to their associated ICN hub room.
2. Terminate both the patch panel or the BIX block and the workstation ends of each cable drop as specified in the EIA/TIA T568A wiring standard.
3. Label both the workstation faceplate and the hub room patch panel as per ICN labeling standards provided by Sunnybrook.

4. Provide a 7 ft stranded patch cord (for the hub room end) and a 10 ft. solid station cord (for the user end) for each new drop.
5. Patch each new data drop into an available switch port in the hub room and document port info. If no available switch port, I.S. is to be notified immediately.
6. Test each cable drop to EIA/TIA TSB67 Category 6/6a standards with a Microtest "PentaScanner" LAN tester or equivalent.
7. Install wire raceway or ceiling access panels if required.

Scope of Work for Voice Cabling

The extent of the MAC work includes but is not limited to the following:

1. Place Voice cabling in existing horizontal pathway from the offices requiring MAC work to their associated terminal.
2. Terminate the BIX block and the jack ends of each cable drop as specified by the BIX wiring standard.
3. Label both the phone jack faceplate and the terminal BIX block (with the next available cable number) as per labeling standards provided by Sunnybrook.
4. Tone each cable drop to BIX to confirm connectivity.
5. Install wire raceway or ceiling access panels if required.

Installation Requirements

Data Cable

- Cable shall be Belden/CDT IBDN Flex Category 6 or 6a, FT4 or FT6 where required, 4 pair UTP.
- Cables shall not exceed the EIA/TIA T568A wiring standard of maximum 90 meters in length. Every effort has been made to centrally locate the hub rooms to facilitate the length limitations. Any drop that may exceed the 90 meter limit will require I.S. approval.

Voice Cable

- Cable shall be Belden/CDT IBDN Category 3, FT4 or FT6 where required, 4 pair UTP.
- Cables shall not exceed distance to nearest telephone terminal.

Data Jacks

- Data jacks shall be Belden/CDT MDVO, 8p8w, orange for Category 6 and turquoise for Category 6a.

Voice Jacks

- Voice jacks shall be Belden/CDT MDVO, 8p8w, white for digital phone/FAX, or yellow for emergency phones.

Patch Panels and Horizontal Wire Management

- Belden/CDT 48 Port MDVO and CableTalk 2M Managers (**Empty MDVO panels and wire managers installed as a part of the hub room setup**).

Wall Plates / Surface Boxes

- Belden/CDT MDVO 4-port faceplate (white) with surface box where required (**use alternate port of existing plate where temporary ethernet cables are terminated**). Faceplates and surface boxes shall be mounted using screws.

Wire Raceway

- Panduit, Wiremold or equivalent. Large enough to accommodate 4 – Cat6 or Cat6a UTP cables and white in colour.
- Use existing raceway where possible.

Ceiling Access Panels (approved by I.S.)

- In rooms without T-bar ceilings where distribution conduit has been installed (floors H2, H3, H4 only), the conduit stubs into the room above the solid ceiling. A permanent access panel (18” x 18”) shall be strategically installed near the conduit stub to allow for the cable installation to the room.

Patch cords

- 1 Belden/CDT stranded Cat6 (for Cat6 cabling) or Cat6a (for Cat6a cabling) 7 feet wired T568A modular cord for each hub room connection.
- 1 Belden/CDT solid Cat6 (for Cat6 cabling) or Cat6a (for Cat6a cabling) 10 feet wired T568A modular cord for each workstation connection.
- Patch cords for Cat6 shall be orange and for Cat6a shall be light green.

Labels

- All labels shall be mechanically printed permanent self adhesive (**no hand written labels will be accepted**). See the last page for labeling standards.

Testing

- Cable testing shall be to EIA/TIA TSB67 standards and include the following information:
 - a. Cable Identification (Workstation Room # / Hub Room # / Port #)
 - b. Cat6 or Cat6a test parameter results
 - c. Hub Port Identification (Hub I.D. # / Port #)
 - d. Project ID and description, date of installation, company etc.

- All test results shall be submitted to Sunnybrook Information Services Department in an electronic file.

Pathway

An ICN cabling pathway has been installed throughout the SB campus to allow for isolation and management of ICN cable drops.

Most wings have been fitted with a pathway consisting of CaddyCat J-hooks from Erico Industries. The pathway generally follows both sides of each corridor on their respective floors. In areas where ceiling congestion did not allow for j-hook installation, EMT conduit has been installed in sections with gaps to allow for cabling to enter rooms where required.

All cabling in T Wing (OCC – Odette Cancer Centre) should be dropped through the wall. The OCC is a modern building with drywall walls and drop ceiling. All cable drops in the OCC to be set as inside wall drops only (where circumstances allow).

Since each hub room will typically service 3 floors, vertical access to adjacent floors has been done using vertical conduits from the ceiling space of one floor to the ceiling space of the other.

Where a cable or cables leave the pathway to enter a room, a conduit sleeve (3/4” for 1 - 2 cables or 1” for 3 - 6 cables) must be installed to access the room and properly fire stopped after the cabling has been installed.

Several wings or partial wings have had a network of zone and distribution conduit installed for ICN cabling. From the hub room, 2” EMT conduit has been install to a pull box in each predetermined zone. From each pull box there has been installed a 1” EMT pipe to rooms in that specific zone deemed as requiring an ethernet connection. Cabling shall be installed through the proper zone and distribution conduit to each room.

Conduit fill ratios have been considered and should be met. If an exception exists, Information Services is to be notified for consultation.

Conditions

1. No ceiling space shall be accessed without a valid Ceiling Access Permit (CAP) received from the Occupational Health and Safety Coordinator and properly displayed.

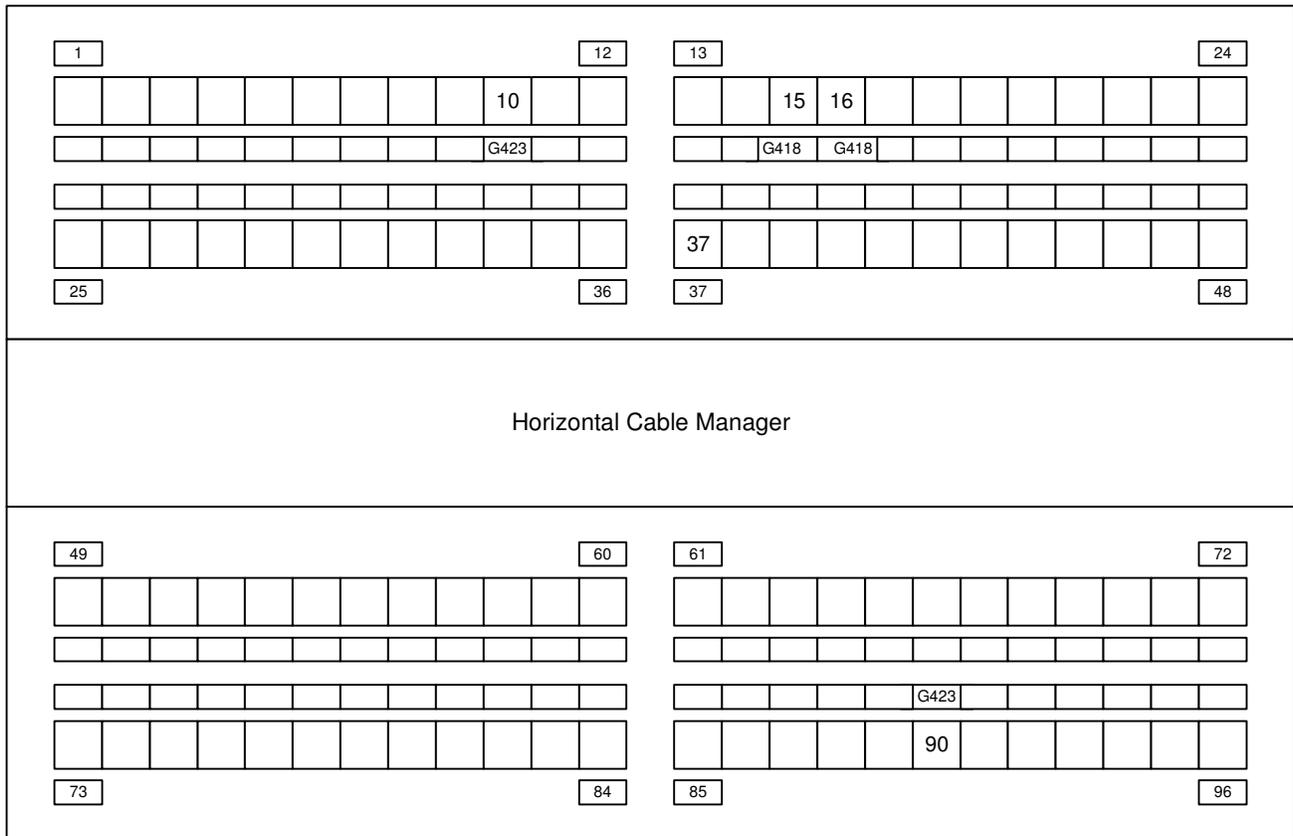
2. Most of the work can be done during normal business hours with the understanding that corridor traffic flow must not be compromised.
3. Access to all locked doors will be through Fire and Security Services. Be prepared to wait at times for access to any given room. All doors **MUST** be locked upon completion of work.
4. All individuals working on the cabling projects must have valid picture I. D. provided by the Fire and Security Department of Sunnybrook.
5. MAC work should be completed within 10 business days from the day of assignment or as scheduled (Projects).
6. Most projects/installations (marked as matrix III and IV) will require medical contamination control due to sensitive areas in the hospital. The cabling vendor should own professional construction equipment/material such as mobile cubicles equipped with hepa vacuum cleaner, asbestos masks and plastic sheets for manual tenting.
7. All persons to be employed as Cable Installers at Sunnybrook are required to attend a minimum ½ day Asbestos Awareness Training Session by an outside consultant. Acceptable training programs are offered by Pinchin Environmental, T. Harris Environmental, Jacques Whitford Environmental, and some labour unions. Certificates of training must be copied and given to the Occupational health and Safety Coordinator at Sunnybrook. The accepted contractor must also meet with the Safety Coordinator to review their work and sensitive asbestos areas prior to starting work. The contractor needs to be aware that they must report unsafe conditions to Occupational Health and Safety Coordinator.
8. All persons to be employed as Cable Installers at Sunnybrook are required to attend awareness session provided by Infection Prevention & Control, hosted on-site at Sunnybrook.

- V-91 is voice cable terminating on BIX panel port 91 in nearest Bell voice closet

Note: if only a number is provided then it is assumed to be a data cable.

Equipment End Location – ICN Hub Room

Each hub room will have data cables terminated on a patch panel. All patch panel ports will be consecutively numbered such that all ports will be uniquely identified regardless if there are several panels on several network racks. The end ports will be labeled at top/bottom consecutively starting from 1 to nnn as illustrated in the following diagram. The centre labels will indicate the device room number where the cable comes from



Equipment end Patch Panels - ICN Hub Room G402

Data Centre and Hub Room Access Policy

Sunnybrook Health Sciences Centre		Policy No:	ICS-025
Title	Data Centre and Hub Room Access Policy	Original: <i>(mm/dd/yyyy)</i>	06/11/2012
Category	Information and Communication Services	Reviewed: <i>(mm/dd/yyyy)</i>	06/11/2012
Sub-Category	Network & Security	Revised: <i>(mm/dd/yyyy)</i>	10/05/2012
Issued By:	IT Operations Committee		
Approved By:	Sam Marafioti		

The Sunnybrook Intranet document is considered the most current.
Please ensure that you have reviewed all linked documents and other referenced materials within this page.

Data Centre and Hub Room Access Policy

Policy

It is Sunnybrook's policy to permit only authorized access to data centre and hub rooms in accordance with Sunnybrook Information Services security policies and procedures in order to ensure the integrity and availability of services dependent on these mission critical resources.

Definitions

Agent means any authorized Sunnybrook person accessing a data centre or hub room.

Visitor means any authorized non-Sunnybrook person seeking access to a data centre or hub room.

Purpose

This policy outlines Information Services standards for access to and maintenance of all Sunnybrook data centres and hub rooms ("facilities"). The policy is intended to enable secure access to facilities and to ensure that these facilities are maintained and operated in a safe, clean and effective manner in order to provide continuous service for dependent systems and infrastructure. All persons accessing data centres or hub rooms must abide by this policy. Failure to comply may result in loss of facility access privileges and/or removal

of equipment.

Applicability

This policy applies to:

- All authorized Information Services administrators and their authorized agents who maintain equipment owned and operated by Information Services in a data centre or hub room; and
- Any other Sunnybrook person who owns or maintains equipment housed in or accessed via any Sunnybrook data centre or hub room.
- Any Visitor for any purpose whatsoever.

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Procedures

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1 - Authorized Data Centre and Hub Room Activities

Hub rooms are intended to be single purpose rooms for accommodating Information Services network systems (network cabling and equipment), servers and storage systems and may include associated cables, monitors, power, air conditioning units, temperature monitoring units, humidity monitoring, tape drives, backup media, etc.

In addition, other Sunnybrook authorized corporate systems or infrastructure services may be housed within or accessible through a data centre or hub room, including patient monitor network systems, Medical Imaging PACS network equipment, Research network equipment, etc. Other rooms may have been built as multipurpose rooms which have other corporate systems installed such as fire alarm panels, Coax video systems, etc.

Note: installation of any non-IS owned or operated system or service in a data centre or hub room must receive prior written approval from Sunnybrook's CIO.

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2 – Administrator Responsibilities:

It is the responsibility of each Information Services system administrator to ensure that all data centres and hub rooms and all associated equipment therein are maintained and operated in a safe and effective manner, including the performance of on-going maintenance and monitoring for any unusual conditions, e.g. overheating, flooding, etc.. All non-normal operating conditions must be reported to the Manager of Information Technology at the

earliest opportunity.

- All data centres and hub rooms must be kept in a safe, clean and professional manner at all times. All waste must be immediately disposed of by the respective Administrators and the waste deposited into proper containers.
- All entrances to data centres and hub rooms must be kept clear as per fire/security regulations.
- All non-normal operating conditions must be reported to the Manager of Information Technology at the earliest opportunity.
- Staff failing to adhere to this policy will be reported to Director of Information Technology who will take applicable disciplinary action where required.

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3 – Access

Access to a Sunnybrook data centre or hub room by any person requires

- 1) authorization from Information Services; and
- 2) either an IS escort or a personally issued KeyScan-enabled Sunnybrook ID badge.

- KeyScan-enabled access does not require an Information Services escort. Those persons accessing a data centre or hub room who have not been issued a KeyScan-enabled card must be escorted.
- Escort, where required, must be provided by either an authorized Sunnybrook Information Services or Security Services representative.
- KeyScan-enabled card access will generally be provided to authorized Sunnybrook staff (agents) and 3rd parties (visitors) requiring routine, non-escorted access on an individual, case-by-case basis.
- Individuals must only use a personally issued KeyScan-enabled card and all individuals must either scan in or be escorted to enter a room (all tailgating is strictly prohibited).
- Access (whether by escort or KeyScan) will be logged and routinely audited by information Services.

Sunnybrook Information Services Purposes

Sunnybrook agents (IS and non-IS departmental server admins) requiring temporary or permanent access to data centres and hub rooms must send a request to the IS Network team and receive written authorization prior to access.

Temporary access to these rooms will be granted on a short-term basis for 3rd

party vendors or other visitors performing work on behalf of Information Services (e.g. for software or hardware installation or maintenance).

Sunnybrook Non-Information Services Purposes

Access to data centres and hub rooms for non-IS purposes must be authorized by the Director of Information Technology or designate. Temporary access to these rooms will be granted on a short-term basis for 3rd party vendors (visitors) requiring access to service or install non-IS systems in the room (e.g. renovations to the room, service or installation of air conditioning, etc.), including but not limited to:

- Installation or service of any non-IS systems such as Patient Monitor, PACS or Research, fire alarm panels, security system panels, electrical service panels, coax TV systems, etc.
- For construction work near or in these rooms requiring access, including installation of conduit or cables that will pass through the rooms; etc.
- Access by other non-IS Sunnybrook project managers, maintenance and service personnel or their agents (e.g. for Facilities Planning or Maintenance personnel, vendors or contractors) who may require access to these rooms to implement projects, install systems or maintain and service essential systems such as on an ongoing basis or in emergencies.

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4 - Security:

Authorized Access Only

Access to data centres and hub rooms is absolutely restricted to authorized individuals as documented in this policy and as identified by the Manager, Information Technology in the IS Network Team Data Centre and Hub Room Access access control list.

- All data centres and hub rooms must be kept locked at all times.
- Access to data centres and hub rooms will be logged and audited by the Manager, Information technology
- All persons requesting access will be required to supply identifying information (name, company name or department, room number and phone number/local) and the purpose for entry before being granted access.
- Access is permitted for those activities required for the indicated purpose and under no circumstances shall other activities occur for any other purpose without written approval of the Manager, Information Technology.

- Security badges must be worn at all times.

Visitors

- All Visitors must be escorted at all times by an authorized SB Information Services staff or member of Sunnybrook's Security staff unless they have been issued a KeyScan-enabled Sunnybrook ID badge (see Appendix 1).
- Authorized Visitors who may require continuous access for greater than 5 days may be provided with a temporary Visitors' badge enabling KeyScan access at their cost or at the cost of their sponsor at the discretion of the Manager, Information Technology.
- Visitors are not permitted to have possession of any data centre or hub room access lock key other than an authorized KeyScan-enabled Sunnybrook ID badge which has been assigned to them personally.

Enforcement:

- Any person found to have violated this policy may be subject to disciplinary action, up to and including termination of employment and/or legal action at the sole discretion of Sunnybrook Health Sciences Centre.

Contact Information:

George Lee	x4219	page 7308
David Chong	x7232	page 8101
Myles Leicester	x4377	page 8137
Wilfred Yan	x85322	page 5416
IS Help Desk	x4159	
Fire and Security	x4589	

Appendix 1

Requesting Access to ICN Data Centres and Hub Rooms

The following procedures must be used for requesting access to any Sunnybrook data centres or hub room.

Requesting access during business hours:

- 1) Users requiring access to data centres or hub rooms must email the IS Network team for access. The IS Helpdesk can also be called and will, in turn, email and page the ICN Network team. Users are to identify themselves and indicate the reason they require access to this room as well as date and time required.
- 2) The IS Network team will review the request and access may require further management approval without prior notice.

- 3) The IS Network team may personally provide access to the room or submit a request to Sunnybrook Security Services to authorize access.
- 4) The IS Network team will log all access, including identity of user, data centre or hub room number, date, start and stop times and reason for access.

Requesting access after business hours:

- 1) Users requiring access to hub room must call the Security office (ext. 4589) to request access. Users must identify themselves and indicate the reason they require access.
- 2) Security will only provide access to persons appearing on a list of pre-approved personnel provided by the IS Network team or based on prior written permission of a member of the IS network Team or the manager, Information Technology.
 - a) If a person is authorized for entry, Security will open the door to permit user access to the room.
 - b) If user is not authorized for entry then Security will deny access and advise the user to contact IS the following day.
 - i) If the user cannot wait then Security may contact the IS Helpdesk for assistance in contacting an authorized IS representative.
 - ii) If Security contacts the IS Helpdesk, the Helpdesk personnel will assess the request and, if necessary, email and page the ICN Network Team for directions.
- 5) Security will log all access, including the identity of user, data centre or hub room number, date, start and stop times and purpose for access.

Requesting KeyScan Access

Note: Some rooms are equipped with KeyScan access. Visitors may be assigned KeyScan-enabled Sunnybrook ID badge as noted above, however only escorted Visitor access can be granted to rooms without KeyScan pads.

The following procedure is used for requesting KeyScan access to data centres:

1. User submits request by email to IS Helpdesk or IS Network team. Name, department, phone number and pager number of person(s) requiring access, data centre(s) to be accessed and reason for access must be provided. Pre-approved requests may be provided by IS management on behalf of the user.
2. All requests will be forwarded to IS Network team. If the request is questionable then it will be forwarded to IS management for approval. (e.g. to install non-IS systems or allow departmental servers to be installed in the ICN data centres).

3. If a request is approved and accepted then the IS Network team will forward an e-mail to Security to authorize access via KeyScan.

Note: Security will not accept requests directly from users and will only accept requests from the IS Network team.

If short term temporary access is requested then the IS Network team will specify the number of days for which access has been granted.

4. Security will create a KeyScan-enabled Sunnybrook ID badge for the approved access and confirm back to ICN Network team and/or directly to the user(s) requiring access. Vendors requiring a temporary ID badge can pick it by visiting the Security office (CG03) only after providing proper identification. Prior email notification of access approval must be received by Security from the IS Network team.

No person may use a KeyScan-enabled Sunnybrook ID badge which has not been assigned to them personally to access a data centre or hub room.

5. If temporary access was issued, at the completion of the access period, IS Network team will issue a follow-up email to Security to remove access.
6. If IS Network team is informed of a user leaving the hospital who no longer requires access to a room, IS will issue an email to Security to remove any KeyScan access which may have been previously assigned to that individual.
7. The IS Network team will maintain a spreadsheet of users that have been granted Keyscan access. Date of request and room accesses granted as well as the date of request or access code removal will be recorded.

POLICY & PROCEDURES

RE: Code White, Code Blue, and Nurse Call Buttons

Corporate Planning & Development



Date: September 20, 2019

Issued by: S. Marafioti

Policy: Code White, Code Blue, and Nurse Call Buttons Installation Policy for Renovation and/or New Construction Projects

Procedure for the installation of Code White, Code Blue, and Nurse Call buttons/pull cords in renovation and/or new construction projects

1. During the Design Development phase, the Corporate Planning & Development (CPD) Project Manager (PM) must notify the user group/area stakeholders, representatives from the Occupational Health & Safety, Security, Risk Management, Biomedical Engineering, and Emergency Preparedness departments of any installations and/or replacements of existing Code White, Code Blue, and/or Nurse Call buttons required throughout the hospital.
2. The CPD PM must make note that all new and renovated areas should be considered for security enhancements during the Design Development phase. The potential enhancements are to be further discussed with Security prior to obtaining their approval.
3. The CPD PM must receive approval from all aforementioned stakeholders on the location(s) and specification of the button(s) before proceeding with the install.
4. When installing the **Code White** button, the following pre-determined specifications must be met:
 - a. The Code White button must be a WHITE button with BLACK lettering
 - b. The text must read, "CODE WHITE"
 - c. A name plate noting the function of the button must be placed above the button's location
 - d. A cover plate for the button is to be considered in consultation with the Patient Care Manager of the unit and/or with the aforementioned stakeholders
 - e. After installation, the Code White button will be handed over to the Security department
5. When installing the **Code Blue** button, the following pre-determined specifications must be met:
 - a. The Code Blue button must be a BLUE button with WHITE lettering
 - b. The text must read, "CODE BLUE"
 - c. A name plate noting the function of the button must be placed above the button's location
 - d. A cover plate must be placed on all buttons unless indicated by the Patient Care Manager of the unit and/or the aforementioned stakeholders
 - e. After installation, the Code Blue button will be handed over to the Biomed department
6. When installing the **Nurse Call** button/pull cord, the following pre-determined specifications must be met:
 - a. The CPD PM must receive approval from all aforementioned stakeholders
 - b. After installation, the Nurse Call button/pull cord will be handed over to the Biomed department