

**East Hants Sportsplex – CCTV
Video Surveillance System &
Access Control System
1076 Highway 2
Lantz, NS**

**SPECIFICATIONS
2026-06-05**



A.H. Roy
& Associates Ltd.

Mechanical & Electrical
Engineering Consultants

ADMINISTRATION

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PART 1 **GENERAL**

1.1 **DESCRIPTION OF WORK INCLUDED**

- .1 The location is 1076 Highway 2, Lantz, NS.
- .2 Work under this Contract covers the design, supply, and Installation of CCTV Video Surveillance System and Access Control System including site, providing shop drawings and servicing work and services all in accordance with drawings and specifications.

1.2 **CONTRACT**

- .1 The Contract of Agreement between the Owner and the Contractor shall be Standard Construction Document CCDC 2, Latest Edition, Stipulated Price Contract.

1.3 **PROJECT MANUAL**

- .1 Sections of the Project Manual are numbered in conformance with the Master List of Section Titles and Numbers, CSC Document 004E, published jointly by Construction Specifications Canada and The Construction Specifications Institute (USA). Sections are arranged in their standard Division format.
- .2 Sections are written as units of the Work which have been assigned numbers in conformance with the CSC/CSI system. They are arranged in sequence for this Manual. Gaps in the order of numerical sequence do not indicate that a section has been inadvertently omitted from this Manual, but rather that a Section is not required for completion of the Work.
- .3 Sections are not intended to identify absolute contractual limits between Subcontractors, nor between the Contractor and his/her Subcontractors. The Contractor shall organize division of labour and supply of materials essential to complete the Work in all its parts.
- .4 Wherever in the Contract Documents the words "approval", "approved", "direction", "directed", "selection", "selected", "request", "requested", "report", and similar words are used, such approvals, directions, selections, requests and reports shall be given by the Consultant unless specifically stated otherwise.

- .5 Wherever in the Contract Documents the word "provide" is used in any form, it shall mean that the Work concerned shall include both supply and installation of the products required for completion of that part of the Work.
- .6 Wherever in this Project Manual it is specified that Work is to proceed or to meet approval, direction, selection or request of jurisdictional authorities or others, such approval, direction, selection or request shall be in writing.

1.4 ERRORS & OMISSIONS

- .1 If errors or omissions are observed in the Contract Documents, immediately notify the Consultant in writing of all such errors or omissions. In the event no such notice is given, the Contractor will be held responsible for the results of any such error or omission and the cost of rectifying the same.

1.5 DIVISION 01

- .1 The provisions of all sections of Division 01 shall apply to each section of this specification.

1.6 WORK PERFORMED UNDER SEPARATE CONTRACTS

- .1 Work not to be included in the Contract, as noted "NIC" on the Drawings, shall be governed by **GC 3.2-Construction by Owner or other contractors**.
- .2 Commissioning, but with Contractor support/works as identified herein.

1.7 PROJECT SCHEDULE

- .1 Contractor to submit with the tender in location provided on the Tender Form the project completion date described in weeks from the date of award. The Owner intends to award within two (3) weeks of tender closing.
- .2 Within five (5) days of the schedule submission arrange a meeting with the Consultant to review the proposed schedule. Revise as required until approved.
- .3 As construction progresses revise the schedule to compensate for any delays or unforeseen activities so as to maintain the contract completion date. Each schedule submission is to be complete with a statement indicating the changes made, the reason they were changed and confirmation that the project completion date will not change.

The above schedule information is to be submitted monthly.

1.8 EXAMINATION

- .1 Site:
 - .1 Examine site and ensure that each section performing Work related to site conditions has examined it, so that all are fully informed on all particulars which affect Work thereon and at the place of building, and in order that construction proceeds competently and expeditiously.
 - .2 Ensure by examination that all physical features, and working restrictions and limitations which exist are known.
- .2 Construction Measurements:
 - .1 Before commencing installation of Work, verify that its layout is accurate in accordance with intent of drawings, and that positions, levels, and clearances to adjacent Work are maintained.
 - .2 If Work is installed in the wrong location, rectify it before other Work concerned proceeds.

1.9 PROTECTION OF WORK, PROPERTY & PERSONS

- .1 Include in Work necessary methods, materials, and construction to ensure that no damage or harm to Work, materials, property and persons results from the Work of this Contract.
- .2 Protect, and if damaged make good, adjacent private and public property.
- .3 Keep surfaces on which finish materials will be applied, free from grease, oil, and other contamination which would be detrimental in any way to the application of finish materials.
- .4 Protect finished surfaces of completed Work from damage by restriction of access or by use of physical means suitable to the material and surface location. Establish with each Subcontractor the suitability of such protection in each case.
- .5 Protect existing mechanical, electrical, telephone and similar services from damage. If necessary, relocate active services to ensure that they function continuously in safety and without risk of damage.
- .6 Cap off and remove unused utility services encountered during Work after approval is given by the utilities concerned or jurisdictional authorities, whichever may apply. Relocation, removal, protection and capping of existing

utility services shall be performed only by the applicable utility, and of other services by licensed mechanics.

- .7 To prevent soiling or damage to finish flooring where pedestrian traffic occurs after the flooring has been installed, install and maintain 6 mil. polyethylene membrane or reinforced kraft paper temporary protection, secured in place and with joints sealed by reinforced pressure sensitive tape.
- .8 Install plywood panels of minimum $\frac{1}{4}$ " thickness over completed finish flooring materials, on which further construction Work is performed by other trades or delivery of products is made, or both. Seal joints between panels with reinforced pressure sensitive tape.
- .9 Prevent the spread of dust beyond the construction zone by wetting, or by other approved means, as it accumulates.

1.10 FASTENINGS

- .1 Include in the Work of each section necessary fastenings, anchors, inserts, attachment accessories, and adhesives. Where installation is in Work for other sections, locate devices for other sections and cooperate with them as they require.
- .2 Do not install wood plugs or blocking for fastenings in masonry, concrete, or metal construction, unless specified or indicated on drawings.
- .3 Do not use fastenings which cause spalling or cracking of materials in which installed. Do not use powder actuated fastening devices unless specified.
- .4 Install metal-to-metal fastenings fabricated of the same metal, or of a metal which will not set up electrolytic action causing damage to fastenings or components, or both, under moist conditions. Use non-corrosive or galvanized steel fastenings for exterior Work at windows, frames, roofing, sheet metal, and attached to, or contained within, exterior walls and slabs.
- .5 Install Work with fastenings or adhesives in sufficient quantity to ensure permanent secure anchorage of materials, constructions, components, and equipment. Space anchors within limits of load bearing or shear capacity.
- .6 Galvanize steel anchors in masonry. Leave steel anchors bare when cast in concrete.

- .7 Space exposed fastenings evenly and in an organized pattern. Keep the number to a minimum but ensure that structural requirements are met, and visible distortion of surfaces does not result. For exposed fastenings use metal of same material, texture, colour and finish as metal on which they occur.

1.11 CLEANING

- .1 Include in the Work of each section the removal of spatters, droppings, soil, labels, and debris from finished surfaces and from surfaces to receive finishes, before they set up. Leave Work and adjacent finished Work in new condition.
- .2 Ensure that only cleaning materials are used which are recommended for the purpose by both the manufacturer of the surface to be cleaned and of the cleaning material.
- .3 Immediately before and during finishing Work maintain areas "broom clean". Vacuum clean interior areas immediately before finish painting commences.
- .4 Do not burn or bury waste material at the site. Remove as often as required to avoid accumulation to ensure site is maintained clean.
- .5 Ensure that volatile fluid wastes are not disposed of in storm or sanitary sewers or in open drain courses.
- .6 Do not allow waste material and debris to accumulate in an unsightly or hazardous manner. Sprinkle dusty accumulations with water. Provide containers in which to collect waste material and debris.
- .7 Control lowering of materials. Use as few handlings as possible. Do not drop or throw materials from storeys above grade.
- .8 Ensure that cleaning operations are scheduled to avoid deposit of dust or other foreign matter on surfaces during finishing Work and until wet or tacky surfaces are cured.
- .9 Each Section shall supply the General Contractor with instructions for final cleaning of its Work, and for inclusion in Project Data Book as more exactly specified in each Trade Section and in Section 01 33 00 - Submittal Procedures.
- .10 Disposal of waste, source separated, at the East Hants Waste Management Centre in Georgefield, Nova Scotia. Waste must be source-

separated. Tipping fees will be waived for waste associated with this project, when preapproved by East Hants.

1.12 SECURITY REGULATIONS

- .1 Perform the Work in conformance to the security regulations of the Local Authorities. Conform to the following:
 - .1 Maintain an accurate inventory of tools and equipment at all times. When Work is not in progress all tools and equipment shall be stored in a secure place. Report loss of any tools or equipment immediately.
 - .2 Workers shall be prepared to identify themselves at any time they are requested while on the site.
 - .3 Restrict workers to only their particular areas of Work.

1.13 OWNER'S OCCUPANCY

- .1 The Owner reserves the right to occupy and use portions of the project, whether partially or entirely completed, or whether completed on schedule or not, provided such occupancy does not interfere with the Contractor's continuing Work.
- .2 Partial occupancy or installation by the Owner of his equipment shall not imply acceptance of the project in whole, or in part, nor shall it imply acknowledgement that the terms of the agreement are fulfilled.

END OF SECTION

PART 1 **GENERAL**

1.1 **DESCRIPTION**

- .1 Coordination of the Work of all Sections of the Project Manual is the responsibility of the General Contractor, including Work of Mechanical and Electrical Divisions.
- .2 The Contractor's responsibilities include, but are not restricted to, coordination specified in this Section, unless specified otherwise.

1.2 **RELATED WORK**

- .1 Coordination of the systems specified in Mechanical and Electrical Divisions is the responsibility of those divisions respectively.

1.3 **QUALITY ASSURANCE**

- .1 Requirements of Regulatory Agencies:
 - .1 Coordinate requirements of jurisdictional authorities.
- .2 Source Quality Control:
 - .1 Ensure that Work meets specified requirements.
 - .2 Schedule, supervise and administer inspection and testing as required.
- .3 Job Records:
 - .1 Maintain job records and ensure that such records are maintained by Subcontractors.

1.4 **SUBMITTALS**

- .1 Prepare schedule and expedite submission of specified submittals.
- .2 Review submittals and make comments as specified in Section 01 33 00 - Submittal Procedures.
- .3 Maintain a log of submittals to ensure their original submission on schedule, and their subsequent revisions and resubmissions.

1.5 **PRODUCT DELIVERY, STORAGE AND HANDLING**

- .1 Schedule delivery of products and provide delivery access and unloading areas.

- .2 Make available areas for storage of products and construction equipment to meet specified requirements and to ensure a minimum of interference with progress of the Work and relocations.
- .3 Make available access for transference of stored products and construction equipment to Work areas.

1.6 JOB CONDITIONS

- .1 Ensure that Work proceeds under conditions meeting specified environmental requirements.
- .2 Ensure that conditions within the building are maintained to meet specified environmental requirements.
- .3 Ensure that protection of adjacent property and the Work is adequately provided and maintained to meet specified requirements.

1.7 CASH ALLOWANCES

- .1 Not applicable.

1.8 WARRANTIES

- .1 Ensure that warranties are provided as specified.
- .2 Coordinate warranty conditions of interconnected Work to ensure that full coverage is obtained.

1.9 COORDINATION

- .1 Coordinate all Work in each area and Work on which subsequent Work depends to facilitate mutual progress, and to prevent conflict between parts of the Work.
- .2 Ensure that each Section makes known for the information of the Contractor and other sections, the environmental and surface conditions required for the execution of its Work, and the sequence of others' Work required for installation of its Work.
- .3 Ensure that each section, before commencing Work, knows requirements for subsequent Work, and that each section is assisted in the execution of its preparatory Work by sections depending upon its preparation.
- .4 Ensure that setting drawings, templates, and all other information necessary for the location and installation of materials, holes, sleeves,

inserts, anchors, accessories, fastenings, connections, and access panels are provided by each section the Work of which requires cooperative location and installation by other sections, and that such information is communicated to the applicable installer.

- .5 Deliver materials supplied by one section to be installed by another well before the installation begins.
- .6 Sections giving installation information in error, or too late to incorporate in the Work, shall be responsible for having Work done which was thereby additionally made necessary.
- .7 Remove Work installed in error which is unsatisfactory for subsequent Work.

1.10 METRIC/IMPERIAL DIMENSIONED COMPONENTS

- .1 Install metric dimension components incorporated with imperial dimension construction only with the Architect's approval unless specified in SI.
- .2 Such substitution will be approved only if components of the same dimension system are not available, and if they can be incorporated with minor dimensional adjustments with no effect on the total Work, sound construction and design intent.
- .3 Submit proposal for substitute to the Architect for his approval before components are fabricated for the Work.

1.11 CUTTING & PATCHING

- .1 Refer to the General Conditions of Contract.
- .2 Cut and patch to provide for connection of new Work to existing Work and where existing Work is altered. Cutting shall be interpreted as providing new openings in construction. Cutting shall not provide for drilling of holes for fasteners of Work which shall be performed by Sections requiring the fasteners.
- .3 Before cutting, drilling, or sleeving structural loadbearing elements, obtain approval of location and methods.
- .4 Do not endanger Work or property by cutting or similar activities. No section shall cut or alter the Work of another section unless approved by the section which has installed it.
- .5 Cut and drill with true smooth edges and to minimum suitable tolerances.

- .6 Fit construction tightly to ducts, pipes and conduits to stop air movement completely. The section performing Work that penetrates a fire, air, vapour, moisture, thermal or acoustic separation element of the building shall pack voids tightly with rock wool; seal air, vapour and moisture barriers; and caulk joints as may be required to ensure that no air movement through the penetration is possible.
- .7 Cutting, drilling and sleeving of Work shall be done only by the section which has installed it. The section requiring drilling and sleeving shall inform the section performing the Work of the location and other requirements for drilling and sleeving. The Contractor shall directly supervise the performance of cutting and patching.
- .8 Replace, and otherwise make good, damaged Work.
- .9 Cutting and Patching for Holes Required by Mechanical & Electrical Work:
 - .1 Include under Work of Mechanical Divisions cutting or provision of holes up to 8" in diameter and related patching.
 - .2 Include under Work of this section holes and other openings required by the Work of Mechanical Divisions which are larger than 8" in diameter or least dimension, and chases, bulkheads, furring and required patching. This section shall be responsible for determination of Work required for holes in excess of 8" diameter or least dimension.
 - .3 Include under the Work of Electrical Divisions all cutting or provision of holes and related patching for the Work of that Division.
- .10 All other cutting and patching required by the Work will be the responsibility of the General Contractor.
- .11 Patching or replacement of damaged Work shall be done by the Subcontractor under whose Work it was originally executed, and at the expense of the Subcontractor who caused the damage.
- .12 Make patches invisible in final assembly.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 Make submittals specified in this section to the Consultant unless otherwise specified, with additional submissions made, in the manner they direct, to other parties involved with construction of the project as their interests are concerned. These parties are, but shall not be restricted to, consultants, jurisdictional authorities, and Subcontractors whose Work must be coordinated with Work related to submittals.
- .2 Ensure that submissions are made to allow sufficient time for review without the construction schedule being delayed.

1.2 DOCUMENT SUBMISSIONS REQUIRED

- .1 At Commencement of Contract:
 - .1 Performance and Payment Bonds if required.
 - .2 Public Liability and Property Damage Insurance Certificates if required.
 - .3 List of Subcontractors by firm name.
 - .4 Construction Schedule and other required schedules and estimates.
 - .5 Site Specific Safety Plan as per Section 01 41 00 -1.03.9.
 - .6 Labour Rate Breakdown.
- .2 Submit within twenty (20) days of award of Contract:
 - .1 Schedule of Values.
- .3 During Construction:
 - .1 Shop drawings as required.
 - .2 Inspection and test reports.
- .4 Submissions at completion of Work are specified in Section 01 77 00 - Contract Closeout.

1.3 CONSTRUCTION SCHEDULES

- .1 Submit proposed construction schedule at beginning of Project, as specified in Section 01 11 00 - Summary of Work.

- .2 As construction progresses, submit up-dated construction schedules as specified in Section 01 11 00 - Summary of Work.

1.4 SHOP DRAWINGS

- .1 Reference GC 3.10 SHOP DRAWINGS.
- .2 Submit shop drawings **electronically** for which submission requirement is specified in other Sections of this Project Manual. Include in final shop drawings submissions to Contractor detailed information, templates and installation instructions required for incorporation and connection of the Work concerned.
- .3 With each submission, the Contractor shall indicate changes from the contract drawings and specifications that have been incorporated in the shop drawings. Review of such shop drawings incorporating changes shall not relieve the Contractor from responsibility for errors in the shop drawings, or for changes made from the contract drawings and specifications which are not indicated or otherwise communicated in writing with the submission.
- .4 Shop drawing review by the Consultants is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that Consultants approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his/her responsibility for errors or omissions in the shop drawings or of his/her responsibility for meeting all requirements of the contract documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the Work of all Sub-Trades.
- .5 Show on Shop Drawings:
 - .1 Clear and obvious notes of any proposed changes from drawings and specifications.
 - .2 Fabrication and erection dimensions.
 - .3 Details to indicate construction arrangements of the parts and their connections, and interconnections with other Work.
 - .4 Location and type of anchors, and exposed fastenings.
 - .5 Materials and finishes.
 - .6 Descriptive names of equipment.
 - .7 Mechanical and electrical characteristics when applicable.

- .8 Information to verify that superimposed loads will not affect function, appearance, and safety of the Work detailed as well as of interconnected Work.
- .9 Assumed design loadings, and dimensions and material specifications for load-bearing members.
- .10 Dimensions and dimensioned locations of proposed chases, sleeves, cuts, and holes in structural members.
- .6 Engineering data sheets, catalogue cuts and standard diagrams may be substituted for shop drawings where applicable.
- .7 The Contractor shall check, sign and make notations (s)he considers necessary on shop drawings before each submission.
- .8 Shop drawings which require extensive correction will be sent back for revisions and resubmission. Otherwise shop drawings will be sent back with review comments only. Only drawings noted for revision and resubmission need be resubmitted.
- .9 Do not add new details or information to shop drawings after they have been finally reviewed, except when approval is given.
- .10 Do not proceed with Work dependent on shop drawing information until approval is given and verification received from the Consultant. Approval shall not relieve the Contractor of responsibility for execution of Work in accordance with contract documents.
- .11 Fabricate Work exactly as shown on shop drawings. If shop practice dictates revisions, revise drawings and resubmit.
- .12 File one (1) copy of each finally revised and corrected shop drawing at site.
- .13 Shop drawings are specified for submission for all pre-manufactured Mechanical & Electrical items as noted on Mechanical & Electrical Drawings and Specifications.

1.5 SAMPLES

- .1 Refer to Article 8 of the General Conditions of Contract.
- .2 Submit samples for which submission requirement is specified in other sections of this Project Manual.

- .3 Submit samples in duplicate of adequate size to represent the material in its intended use on project. Submit an extreme range of samples when the degree of marking or colour cannot be represented by a single sample.
- .4 Label samples with Project name, number, Contractor, and date.
- .5 When samples are very large, require assembly, or require evaluation at the site, they may be delivered to the site, but only with approval and as directed.
- .6 Include cost of delivery and handling, assembly, and return to supplier of samples in the contract Work.
- .7 If sample is disapproved, both samples will be returned. If sample is approved, one sample will be returned, marked "Approved".
- .8 Approved samples shall serve as a model against which the products incorporated in the Work shall be judged.
- .9 Each product incorporated in the Work shall be precisely the same in all details as the approved samples.
- .10 Should any change of material, colour, texture, finish, dimensions, performance, function, operation, construction, joining, fastening, fabrication techniques, service characteristics, and other qualities be made to a product after approval has been given, request approval of the revised characteristics in writing and resubmit samples of the product for approval if required.
- .11 Refer to Mechanical & Electrical Drawings & Specifications for sample requirements.

1.6 INSERT DRAWINGS

- .1 Submit insert drawings which are required in other sections of the Project Manual.
- .2 Indicate on insert drawings the location and size of sleeves, anchor bolts, openings and miscellaneous items to be incorporated in the Work.
- .3 Submit insert drawings well in advance of construction of Work incorporating built-in Work.

1.7 COORDINATION DRAWINGS

- .1 Prepare drawings to indicate coordination and methods of installation of a system with other systems where they are installed in the same area. Ensure that all details of equipment, apparatus, and connections are coordinated.
- .2 Submit coordination drawings well in advance of fabrication and installation of Work affected.

1.8 RECORD DRAWINGS

- .1 Record, as the Work progresses, changes and deviations in the location of Work concealed by the finished Work, and such other approved changes that occur during progress of Work, to ensure that an accurate record is provided for future maintenance and alterations.
- .2 White prints will be provided by the Consultant for each Trade Package in which record drawings are specified. Record changes in the Work on these prints in red ink.
- .3 Dimension location of concealed Work in reference to building walls, and elevation in reference to floor elevation. Indicate at which point dimension is taken to concealed Work. Dimension all terminations and offsets of runs of concealed Work.
- .4 Record Work constructed differently than shown on contract documents, changes in the Work caused by site conditions, by Owner, Consultant, and Contractor originated changes, and by site instructions, supplementary instructions, field orders, change orders, addenda, correspondence and directions of jurisdictional authorities.
- .5 Record location of mechanical and electrical services, piping, valves, conduits, pull boxes, junction boxes and similar Work not clearly in view, and position of which is required for maintenance, alteration Work and future additions. Do not conceal critical Work until its location has been recorded.
- .6 Identify each record drawing as a "Project Record Copy". Maintain in good condition, do not use for construction purposes and make available to Consultant at all times.
- .7 Maintain in a state current to project. Such state will be considered a condition precedent for validation of applications for payment. The Consultant's visual inspection will constitute proof that record drawings are current.

- .8 Submit record drawings at completion of Work. Final acceptance of the Work will be predicated on receipt and approval of record drawings.

1.9 EXTENDED WARRANTIES

- .1 Submit the extended warranties listed in this Article and as specified in each applicable section of this Project Manual.
- .2 Extended warranties shall commence on termination of the standard one (1) year warranty granted in this Contract as specified in Article 16, Correction after Final Payment, of General Conditions of the Contract, and shall be an extension of these same provisions.
- .3 Submit each extended warranty on a standard Form of Warranty, a sample of which is included in this Section.
- .4 Secure each extended Warranty by a Maintenance Bond in an amount indicated.
- .5 Refer to Mechanical & Electrical Drawings and Specifications for extended warranty requirements in those trades.

1.10 MAINTENANCE MANUAL & OPERATING INSTRUCTIONS

- .1 Submit two (2) hard copies and one (1) electronic copy of Maintenance Manual three (3) weeks prior to application for completion certificate.
- .2 Include in Maintenance Manual one (1) copy of each final approved shop drawing issued for project on which have been recorded changes made during fabrication and installation caused by unforeseen conditions.
- .3 Submit extended guarantees together in one (1) report binder.
- .4 The Manuals shall:
 - .1 Consist of a hard-cover, black, vinyl-covered, looseleaf, letter size binder.
 - .2 Have a title sheet, or sheets preceding data on which shall be recorded project name, Project number, date, list of contents, and Contractor's and Subcontractors' names.
 - .3 Be organized into applicable sections of Work with each section separated by hard paper dividers with plastic covered tabs marked by section.
 - .4 Contain only typed or printed information and notes, and neatly drafted drawings.

- .5 Contain maintenance and operating instructions on all building, and mechanical and electrical equipment.
- .6 Contain maintenance instructions as specified in various sections.
- .7 Contain brochures and parts lists on all equipment.
- .8 Contain sources of supply for all proprietary products used in the Work.
- .9 Contain lists of supply sources for maintenance of all equipment in project of which more detailed information is not included above.
- .10 Contain finished hardware schedule.
- .11 Contain charts, diagrams and reports specified in Mechanical & Electrical Drawings.

1.11 EXTRA STOCK

- .1 Supply extra stock at substantial completion of project as specified in other sections of the Project Manual.
- .2 Deliver extra stock as directed by the Consultant/Owner to location he designates.
- .3 Refer to Mechanical & Electrical Drawings & Specifications for extra stock requirements in those trades.

1.12 INSPECTION LABORATORY REPORTS

- .1 Submit copies of inspection and test reports obtained by the Contractor and Subcontractors for their Work or for Jurisdictional Authorities, if requested by the Architect.

1.13 DOCUMENTATION ON SUPPLIERS & MANUFACTURERS

- .1 Provide information under headings identifying the following: Associated Technical, Section, Manufacturer, Supplier, Contact Name, Phone Numbers.

Following this Section: Sample Form of Warranty

END OF SECTION

Sample Form of Warranty

Date: _____

Client: _____

Project: _____

Warranty: _____

(Title of Work)

We hereby undertake to warrant all materials supplied and installed under our Contracts and include the providing of necessary materials and labour to cover the result of faulty materials or workmanship. Upon written notification from Client or the Consultant that the above work is defective any repair or replacement work required shall be to the Consultant's satisfaction at no cost to the Client. This Warranty shall not apply to defects caused by the work of others, maltreatment of materials, negligence or Acts of God. This Warranty shall remain in effect for the total period from the acceptance of the Work to (....date....), irrespective of the date of completion or the beneficial use by the Client.

Signature: _____

**Authorized Signing
Officer:** _____

Name of Firm: _____

Address: _____

PART 1 **GENERAL**

1.1 **REFERENCES**

- .1 Observe construction safety measures of:
 - .1 National Building Code 2020, Part 8.
 - .2 National Fire Code of Canada
 - .3 Provincial Building Code Act
 - .4 Occupational Health and Safety Act SNS 1996, Chapter 7 and Regulations including but not limited to:
 - .1 Fall Protection and Scaffolding Regulations
 - .2 First Aid Regulations
 - .3 Workplace Hazardous Material Information System Regulations
 - .4 Occupational Safety General Regulations
 - .5 Workers' Compensation Act
 - .6 Nova Scotia Fire Safety Act
 - .7 Dangerous Goods Transportation Act
- .2 All construction sites shall conform to the Nova Scotia Smoke Free Places Regulation.
- .3 In case of conflict or discrepancy the more stringent requirement shall apply.
- .4 Where reference is made to jurisdictional authorities, it shall mean all authorities who have within their constituted powers the right to enforce the laws of the place of the building.

1.2 **HAZARDOUS MATERIAL**

- .1 Should material resembling hazardous materials other than those identified with the Contract Documents, including but not limited to spray or trowel applied asbestos, be encountered in course of Work; stop Work immediately. Do not proceed until written instructions have been received from Consultant.
- .2 Where Work entails use, storage, or disposal of toxic or hazardous materials, chemicals and/or explosives, or otherwise creates a hazard to life, safety, health, or the environment; Work shall be in accordance with the Jurisdictional Authority.

1.3 SITE CLEANING

- .1 Maintain clear access on public sidewalks and roads.

1.4 FIRE SAFETY REQUIREMENTS

- .1 Enforce fire protection methods, good housekeeping and adherence to local and underwriter's fire regulations including, but not limited to, National Fire Code of Canada, Nova Scotia Fire Safety Act and the Provincial Building Code Act. Provide UL approved fire extinguishers, and other firefighting services and equipment, except where more explicit requirements are specified as the responsibility of individual Sections.
- .2 Fire Separations:
 - .1 Ensure that fire separations are installed to maintain total integrity and that they are not breached by Work following their installation.
 - .2 Replace fire separations which have suffered a lessening of their required rating during construction.
- .3 Smoking is NOT PERMITTED on site.

1.5 REPORTING FIRES

- .1 Know the location of the nearest fire alarm box and telephone, including the emergency phone number.
- .2 Report immediately all fire incidents to the fire department.
- .3 The person reporting the fire shall ensure that the Fire Department is adequately directed to the scene of the fire.
- .4 Give location of fire, name or number of building and be prepared to verify the location.

1.6 OH&S DOCUMENT SUBMISSION

- .1 Ensure that the OH&S Document submission applies to the Work of this specific project and site.
- .2 Submit one electronic copy of a project specific OH&S Document at the Pre-Construction Meeting for all Work to be performed on the project. OH&S Document to be submitted prior to commencement of any Work on site, or delivery of any materials to the site.
- .3 OH&S Document submission shall contain specific information detailing the methods and procedures to be implemented by the contractor to

ensure compliance with the OH&S Act and regulations and any other contractual requirements specified in this section and to ensure:

- .1 The health and safety of all persons at or near the Work including the public.
- .2 Compliance with requirements of the regulatory agencies.
- .3 All employers, contractors, constructors, suppliers, employees, self-employed persons, owners, providers of service, architects and engineers performing Work under this contract comply with the requirements of all applicable regulatory agencies.
- .4 Where changes to the Work require changes to the OH&S methods and procedures, modify and resubmit the OH&S Document to the Consultant prior to implementing the changes.
 - .1 Organize OH&S Document in the form of a typed instruction manual.
 - .2 Arrange the contents under the following Headings.
 - .1 Employee OH&S Training: all employees working on this specific project have training requirements of the OH&S Act and Regulations.
 - .2 Company Safety Policy: provide the company's Occupational Health and Safety Policy.
 - .3 Company Safety Rules: provide company general safety information and include company disciplinary policy for violations of OH&S Act or Regulations.
 - .4 Hazard Identification System: provide details on the system used to identify potential hazards.
 - .5 Supervision: identify the general contractor's employee designated to oversee all OH&S related matters.
 - .6 Emergency Action Plan:
 - .1 First aid services - Include location of first aid stations, attendants, services, supplies and the posting of first aid information.
 - .2 Posting of information - Include information identifying trained emergency response staff, phone location for emergency use, project address and all necessary emergency service phone numbers and locations.
 - .3 Fire Protection - Advise local firefighting authority in the area of Work of project startup date, provide firefighting authority access to and a tour of the project prior to commencement of Work. Advise the firefighting authority during the project of any Work

- that would impede fire apparatus response. Include reporting of fires procedures.
- .4 Work Stoppage - Provide information on the securing of areas during emergencies and how information is communicated to persons present on site during such emergencies.
 - .3 Joint Occupational Health & Safety Committee - Provide rules of procedure under which the JOHSC will operate including but not limited to membership details, meeting schedules, posting of meeting minutes, chairing of meetings and the role of the JOHSC on the project. Provide information on safety representatives' roles and responsibilities on the project during periods where a JOHSC is not in place.
 - .4 Project security/access plan-provide a site plan including but not limited to: vehicle access, employee access, gates, fencing, hoarding and general site security.
 - .5 Communication of Information-describe methods to be used to communicate all OH&S related information to all persons on the project. Information is to include but not be limited to the posting of first aid information, JOHSC members' names, JOHSC meeting minutes, copies of the OH&S Act and regulations, copies of ongoing inspections and hazard assessments, etc.

Following this Section: Occupational Health and Safety Summary

END OF SECTION

Occupational Health and Safety Summary
(to be submitted with each monthly Progress estimate)

The following information summarizes Occupational Health and Safety activities on the project conducted by the Contractor during the month and includes activities of Subcontractors. Activities include all matters prescribed by the Occupational Health and Safety Act and Regulations and the submitted Occupational Health and Safety Document for the Project.

Indicate the applicable number below:

- # _____ new contractors on site
- # _____ orientations
- # _____ toolbox talks
- # _____ safety meetings
- # _____ Joint Occupational Health
and Safety Committee meetings
- # _____ hazard assessments
- # _____ formal written inspections
- # _____ warnings issued to employees or subcontractors
- # _____ other, explain _____

List new Contractors on Site below:

The Contractor certifies that the above noted activity list is accurate and that during the month:

Check

- ☐ All activities on the Project were found to be in compliance with the Occupational Health and Safety Act and Regulations.
- ☐ Some activities on the Project were not found to be in compliance with the Occupational Health and Safety Act and Regulations but were adequately corrected in an appropriate time frame. Explain:

Prepared by:

Certified by:

(Contractor Project Manager)

(Contractor Senior Management)

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Final Cleaning.
- .2 Spare parts and maintenance materials.
- .3 Take over procedures.

1.2 **RELATED SECTIONS**

- .1 Individual Specifications Sections: Specific requirements for operation and maintenance data.

1.3 **FINAL CLEANING**

- .1 Refer to the General Conditions of Contract.
- .2 Before final inspection, replace any components that were broken or damaged during construction.
- .3 Remove temporary protections and make good defects before commencement of final cleaning.
- .4 Remove waste products and debris other than that caused by the Owner, other contractors or their employees, and leave the Work clean and suitable for occupancy by Owner.
- .5 Remove surplus products, tools, construction machinery and equipment. Remove waste products and debris other than that caused by the Owner or other Contractors.
- .6 Remove stains, spots, marks and vacuum dirt from electrical fixtures, floors, walls and ceilings affected by work.
- .7 Removing visible labels left on materials, components, and equipment.
- .8 Maintain cleaning until Owner has taken possession of building or portions thereof.

1.4 **SPARE PARTS AND MAINTENANCE MATERIALS**

- .1 Spare parts and maintenance materials provided shall be new, not damaged or defective, and of the same quality and manufacture as

Products provided in the Work. If requested, furnish evidence as to type, source and quality of Products provided.

- .2 Defective Products will be rejected, regardless of previous inspections. Replace products at own expense.
- .3 Store spare parts and maintenance materials in a manner to prevent damage, or deterioration.
- .4 Provide spare parts, special tools, maintenance and extra materials in quantities specified in individual specification Sections.
- .5 Provide items of same manufacture and quality as items in the Work.

1.5 DEMONSTRATION OF SYSTEMS & EQUIPMENT

- .1 Give a complete demonstration of all systems and equipment in the presence of the Consultant at the following times:
 - .1 When each is 100% completed at the request of the Contractor.
 - .2 At time of inspection to validate final completion.
 - .3 At final completion for the benefit of the maintenance staff for the Project.
- .2 Responsible personnel representing the Subcontractor responsible for the Work being demonstrated shall be present at each demonstration.
- .3 A Digital submission of this will be required.

1.6 SUBMITTALS

- .1 Submit with application for substantial performance certificate.
 - .1 Certificate of substantial completion inspection report from electrical utility or inspection.
 - .2 Certificate of verification of fire alarm system.
 - .3 NS Power Inspection Report.
 - .4 Maintenance Manuals and Operating Instructions.
 - .5 Final project record drawings.
- .2 Submit with application for release of final payment:
 - .1 Performance bonds which shall remain in effect for one (1) year after take-over date.
 - .2 Completed Liability Insurance Policy extended for one (1) year from take over date.

- .3 Written guarantee covering all workmanship and materials used in the Work.
- .4 Maintenance bonds as specified.
- .5 Certificate from Workers' Compensation Board.

1.7 FINAL INSPECTION PROCEDURES

- .1 Schedule, make arrangements for and administer final inspections and close out in the following stages.
- .2 Contractor's Inspection:
 - .1 Determination that Project meets requirements for substantial performance and inspection is the responsibility of the Contractor.
 - .2 The Contractor and all Sub- Contractors shall conduct an inspection of the Work, identify deficiencies and defects; repair as required. Notify the Consultant in writing of satisfactory completion of the contractor's Inspection and that corrections have been made and request a Consultant's Substantial Performance Inspection.
- .3 Consultant's Inspection: Consultants and the Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. The Contractor shall correct Work accordingly.
- .4 Substantial Performance Inspection:
 - .1 When the items noted above are complete, request a substantial performance inspection of the Work by the Consultant, and the Contractor. If Work is deemed incomplete, complete the outstanding items and request a reinspection.
 - .2 Substantial performance inspections shall be scheduled to begin within eight working days of the Contractor's request.
 - .3 Present at the substantial performance inspection will be:
 - .1 The Consultant and his Sub-consultants that he requires and notifies.
 - .2 The Owner's representatives, upon notification by the Consultant.
 - .3 The Contractor and such Sub-Contractors that he considers are required.
 - .4 The Contractor will compile a substantial performance deficiency list at this inspection and issue it to the Consultant and Owner.
 - .5 The Contractor shall correct substantial performance deficiencies before a date agreed upon by the Contractor and Consultant.

- .6 Upon the Consultant's approval of substantial performance, the Contractor shall submit an application for a substantial performance certificate.
- .7 When the Contractor has satisfied himself that these corrections have been completed in a satisfactory manner by his inspection he shall schedule a final Contractor's inspection by the Consultant, and the Owner's representatives if required, within five working days of the Contractor's request.
- .8 Upon the Consultant's approval of completion, the Contractor shall submit an application for a completion certificate.

1.8 SUBSTANTIAL PERFORMANCE

- .1 The Consultant will issue a Certificate of Substantial Performance when satisfied outstanding deficiencies noted during inspections prior to the substantial completion inspection have been corrected, the Project is substantially complete and is so certified by the Owner.
- .2 A list of remaining deficiencies to be rectified before final acceptance will be attached to the Certificate of Substantial Performance. Final acceptance to occur within three (3) weeks of substantial completion.
- .3 Make submissions specified in Clause 1.06 of this section.

1.9 CERTIFICATE FOR RELEASE OF AMOUNT DUE AT SUBSTANTIAL PERFORMANCE

- .1 The Consultant will issue to the Owner a certificate for release of money in an amount equal to the amount due the Contractor under the Agreement provided they are satisfied that the Work has been substantially completed.
- .2 The certificate shall indicate the date of substantial performance.
- .3 Payment shall be due upon date of substantial performance.

1.10 COMPLETION CERTIFICATE

- .1 The Consultant will issue a Certificate of Completion when they are satisfied that outstanding deficiencies noted during inspections have been corrected and the Work is completed and is so certified by the Owner.
- .2 The date of the completion certificate will commence the required 60-day period before release of final payment.

1.11 CERTIFICATE FOR RELEASE OF FINAL PAYMENT

- .1 The Consultant will issue to the Owner a certificate for release of final payment 60 days after the date of completion certificate, provided they are satisfied that the Work has been completed.
- .2 The certificate will be in an amount equal to the remaining money due the Contractor under the Contract, and shall indicate the date of final completion.
- .3 Payment shall be due upon date of final completion.

1.12 WARRANTIES

- .1 Establishment of Warranties:
 - .1 Warranties shall commence on the date of substantial performance certificate.
- .2 Warranty Period:
 - .1 The Owner will advise the Consultant of defects observed during warranty periods.
 - .2 The Consultant/Owner will notify the Contractor of defects observed during the warranty period and request him to remedy the defects in accordance with the Contractor documents.
 - .3 Thirty days before expiration of warranties the Owner's representatives, the Consultant and the Contractor will inspect the Work as arranged by the Contractor noting defects of products and workmanship.
 - .4 The Contractor shall immediately remedy such noted defects.
 - .5 Over the warranty period, four (4) site warranty meetings will be held on site with representatives of the Owner and the Consultants.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Division 26 – Electrical
- .2 Division 27 – Cabling
- .3 Division 28 - Security

1.2 **REFERENCES**

- .1 Door and Hardware Institute – Recommended locations for Architectural Hardware for Standard Steel Doors and Frames
- .2 Door and Hardware Institute – Recommended locations for Architectural Hardware for Flush Wood Doors
- .3 NFPA 80 – Standard for Fire Doors and Windows, 1999 Edition
- .4 Door and Hardware Institute – Sequence Format for Hardware Schedule
- .5 Door and Hardware Institute – Key Systems and Nomenclature
- .6 Door and Hardware Institute – Abbreviations and symbols used in Architectural Door and Hardware Schedules and Specifications
- .7 Door and Hardware Institute – Installation Guide for Doors and Hardware

1.3 **ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .4 After approval samples will be returned for incorporation in Work.
- .4 Hardware List:

- .1 Submit contract hardware list.
- .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .5 Wiring Diagrams: Submit wiring diagrams for all doors involving electrified hardware and/or access control systems. Wiring diagrams to be coordinated with doors, and electrical and access control hardware specified in Divisions 26, 27, and 28.
 - .1 Co-ordinate with related trades, meet with the owner and security provider and submit a written description of the functional use (mode of operation) of electrical hardware products specified. Include operation for ingress, egress, fire alarm, and after hours use where applicable. Include door and frame elevations showing the location of each item of electrical hardware to be installed, mode of operation including a diagram showing number and size of conductors. Indicate on elevation drawing items provided by related trades, including back boxes, fire alarm and access control connections, and 120V power sources. Provide point to point drawings showing terminal connections necessary for a complete installation.
- .6 Arrange and hold a keying meeting between representatives of the Owner, Consultant, and hardware supplier. Furnish a keying schedule listing the levels of keying as well as an explanation of the key system's function, the key symbols used and the door numbers controlled. Utilize "Door and Hardware Institute - Key Systems and Nomenclature" as a guideline for nomenclature, definitions, and approach for selecting the optimal keying system. Submit keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic to Consultant and Owner.
- .7 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .8 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.4 CLOSE OUT SUBMITTALS

- .1 Submit in accordance with Section 01 70 00 – Contract Closeout.

- .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual. Manuals to include:
 - .1 Name of hardware distributor, address and contact name
 - .2 Copy of final "as-built" finish hardware schedule
 - .3 Wiring diagrams, elevations, risers, point to point
 - .4 Copy of final keying schedule
 - .5 Copies of floor plans with keying nomenclature assigned to door numbers as per the approved keying schedule
 - .6 Catalogue cut sheets and product specifications for each product
 - .7 Parts list for each product
 - .8 Installation instructions and templates for each product

1.5 MAINTENANCE MATERIALS

- .1 Supply maintenance materials in accordance with Section 01 70 00 – Contract Closeout.
- .2 Tools:
 - .1 Supply 2 sets of wrenches for door closers, locksets and fire exit hardware.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Alternates
 - .1 Only specified products or products accepted as alternates during the bidding period are acceptable. Make alternate requests in accordance with Division 1. Include product data and indicate deviations from specified characteristics.
- .4 Maintenance Service
 - .1 After the building is occupied arrange an appointment with the Owner's maintenance staff for instruction of proper use, servicing, adjusting and lubrication of hardware furnished. Submit to the consultant a list of attendees and meeting date.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 00 – General Instructions and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.
- .3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .4 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes.
 - .3 Protect prefinished surfaces with wrapping or strippable coating.
 - .4 Replace defective or damaged materials with new.
 - .5 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and packaging materials as specified in Section 01 00 00 – General Instructions.

1.8 WARRANTY

- .1 Manufacturer's warranties shall be extended, if necessary, beyond the standard warranty for a minimum of 5 years from the date of Substantial Performance.
- .2 Door hardware installation shall be covered under warranty for a period of 5 years from the date of Substantial Performance. This warranty shall cover issues arising with installed door hardware, including electrical components of door hardware.
- .3 Standard warranty and extended warranty shall cover combined locking hardware components when different products are used in combination. Hardware supplier shall inform Consultant at the shop drawing stage if any hardware combinations will not be covered by warranty and advise on substitutions of equal quality and performance that will not void warranty.

PART 2 PRODUCTS

2.1 HARDWARE ITEMS

- .1 Use one manufacturer's products only for similar items.

2.2 DOOR HARDWARE

- .1 Locks and latches:
 - .1 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for function and keyed as stated in Hardware Schedule.
 - .2 Cylindrical locks and latches: to ANSI/BHMA A156.2 series 4000 Grade 1, designed for function and keyed as stated in Hardware Schedule.
- .2 Butts and hinges:
 - .1 Butts and hinges: to ANSI/BHMA A156.1, designated by letter A and numeral identifiers, followed by size and finish, listed in Hardware Schedule.
- .3 Door Closers and Accessories:
 - .1 Door controls (closers): to ANSI/BHMA A156.4, designated by letter C and numeral identifiers listed in Hardware Schedule.
- .4 Door Operators:
 - .1 Power assist and low energy power operated doors: to ANSI/BHMA A156.19.
 - .2 Architectural door trim: to ANSI/BHMA A156.6, designated by letter J and numeral identifiers listed in Hardware Schedule.
- .5 Door bottom seal: heavy duty door seal of extruded aluminum frame clear anodized finish as listed in the hardware schedule.
- .6 Thresholds: full width of door opening, extruded aluminum as listed in the hardware schedule.
- .7 Weather stripping:
 - .1 Head and jamb seal:
 - .2 Extruded aluminum frame as listed in the hardware schedule

2.3 FASTENINGS

- .1 Use only fasteners provided by the manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match the finish of hardware.

- .4 Where pull is scheduled on one side of the door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

2.4 KEYING

- .1 Doors, padlocks and cabinet locks are to be Grand master keyed and construction keyed to a existing Schlage key system as directed. Prepare detailed keying schedule in conjunction with Owner's Representative.
- .2 Supply keys in duplicate for every keyed lock in this Contract.
- .3 Supply 3 master keys for each master key or grand master key group.
- .4 Stamp keying code numbers on keys and cylinders.
- .5 Supply construction keying.
- .6 Hand over permanent keys to Owner.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for proper installation of each hardware component.
- .4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .5 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .6 Install key control cabinet.
- .7 Use only manufacturer's supplied fasteners.

- .8 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .9 Remove construction keying when directed by Owner's Representative and Owner.

3.2 ADJUSTING

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to ensure tight fit at contact points with frames.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
- .4 Remove protective material from hardware items where present.
- .5 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .6 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 00 00 – General Instructions.
- .7 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 DEMONSTRATION

- .1 Keying System Setup and Cabinet:
- .2 Supply and Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards. Wall cabinet with Capacity 3 times the number of key changes.
- .3 Place file keys and duplicate keys in key cabinet on their respective hooks.

- .4 Lock key cabinet and turn over key to Owner.
- .5 Maintenance Staff Briefing:
- .6 Brief maintenance staff regarding:
 - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
 - .2 Description, use, handling, and storage of keys.
 - .3 Use, application and storage of wrenches for door closers, locksets and fire exit hardware.
- .7 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by door hardware installation.

3.6 APPROVED ALTERNATIVE HARDWARE

The following manufacturers' products are approved for use on this project provided they meet or exceed the requirements of quality and function, and all available options including voltage electrical characteristics and warranty of the products listed in the hardware sets.

HINGES

BEST	IVES	MCKINNEY
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CONTINUOUS HINGES

BEST	PEMKO	IVES
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LOCKSETS

BEST	SARGENT	SCHLAGE
45H	8200	9000
9K	10X line	ND SERIES

CLOSERS

DORMA	SARGENT	LCN
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8900	351	4050
8600	1430	1450

DOOR OPERATORS

DORMA	BESAM	GYRO TECH	STANLEY
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EXIT DEVICES

DORMA	SARGENT	VON DUPRIN
8000 SERIES	30 SERIES	22 SERIES

DOOR PULLS, PUSHPLATES, KICK PLATES, STOPS

GALLERY	STANDARD METAL	IVES
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WEATHER STRIP AND THRESHOLDS

PEMKO	ZERO	CROWDER
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ELECTRIC STRIKES

RCI	HES
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3.7 SCHEDULE

Provide hardware as listed for each door number' s group of doors as listed in the hardware groups on door schedule. This schedule is a guide to the requirements for the various hardware applications; the hardware supplier is responsible for door types and quantities by their own review of the plans and contact documents.

Set #1A - SINGLE DOORS - WIRELESS LOCK

Doors: 111, 148, 151, 153, 169, 170-2, 171, 202, 203, 207, 209

1.0 Card Reader Lock	E79 N 1 1 3 1 L L B F 0 0	626	DK
1.0 Door Closer	8616 AF86P COV	689	DK
1.0 Wireless Lock Solutions	75428 Gateway Hub		DK

NOTE: EXISTING STEEL DOOR. INTSTALLER NOTES - REMOVE EXISTING LOCK.
INSTALL NEW WIRELSS LOCK AND STRIKE. ADD OR REPLACE DOOR CLOSER.

ACCESS CONTROL CONNECTION AND PROGRAMMING BY DIVISION 28.
WIRELESS HUB PROVIDED BY THIS SECTION - LOCATION AND QUANTITY TO BE
CONFIRMED BY SITE SURVEY

Set #1B - DOUBLE DOORS - WIRELESS LOCK

Doors: 149, 220, 219

1.0 Card Reader Lock	E79 N 1 1 3 1 L L B F 0 0	626	DK
1.0 Wireless Lock Solutions	75428 Gateway Hub		DK
1.0 Door Closer	8616 AF86P COV	689	DK

NOTE: EXISTING STEEL DOOR. INTSTALLER NOTES - REMOVE EXISTING LOCK.
INSTALL NEW WIRELSS LOCK AND STRIKE. ADD OR REPLACE DOOR CLOSER.
ACCESS CONTROL CONNECTION AND PROGRAMMING BY DIVISION 28.
WIRELESS HUB PROVIDED BY THIS SECTION - LOCATION AND QUANTITY TO BE
CONFIRMED BY SITE SURVEY

Set #1C - DOUBLE DOOR- EXIT DEVICE - CR

Doors: 170-1

1.0 Door Loop	9509 18S	S	RCI
1.0 Exit Device	8300 A 430 LD	689	DK
1.0 Exit Trim	8R 03	626	DK
1.0 Electric Strike	0162	32D	RCI
1.0 Double Door Housing	0162DDH	SPC	RCI
1.0 Astragal	W-8 84.625" SL	Mill	KNC
2.0 Door Position Switch	GRI 29PD		
1.0 Door Controller	BY DIVISION 28		

NOTE: REMOVE EXISTING LOCKSET AND DEADBOLT. REPLACE WITH RIM EXIT
DEVICE AND SECTIONAL TRIM. REPAIR/COVER DEADBOLT PREP. ADD
SURFACE ASTRAGAL TO EXTERIOR OF ACTIVE LEAF. NEW ELECTRIC RIM
STRIKE AND DOUBLE DOOR HOUSING ADDED TO INACTIVE LEAF, ADD DOOR
LOOP FOR POWER TRANSFER. CARD READER AND DOOR CONTROLLER BY
DIVISION 28. POWER FOR ELECTRIC STRIKE BY DIVISION 28. VALID
CREDENTIAL MOMENTARILY ENGAGES ELECTRIC STRIKE, PULL DOOR OPEN.
FREE EGRESS.

Set #1D - SINGLE DOORS - WIRELESS MORTISE LOCK

Doors: 110

1.0 Card Reader Lock	E79 N 1 1 6 6 L L K F 0 0	626	DK
1.0 Door Closer	8616 AF86P COV	689	DK
1.0 Wireless Lock Solutions	75428 Gateway Hub		DK

NOTE: EXISTING STEEL DOOR. INTSTALLER NOTES - REMOVE EXISTING LOCK. INSTALL NEW MORTISE WIRELESS LOCK AND STRIKE. ADD OR REPLACE DOOR CLOSER. ACCESS CONTROL CONNECTION AND PROGRAMMING BY DIVISION 28. WIRELESS HUB PROVIDED BY THIS SECTION - LOCATION AND QUANTITY TO BE CONFIRMED BY SITE SURVEY

Set #1E - SINGLE DOORS - WIRELESS LOCK

Doors: 121, 124, 126, 127, 129, 131, 133, 135, 137, 139, 145, 161, 164, 166, & 168

1.0 Card Reader Lock	E79 N 1 1 3 1 L L B F 0 0	626	DK
1.0 Door Closer	8616 AF86P COV	689	DK
1.0 Wireless Lock Solutions	75428 Gateway Hub		DK

NOTE: EXISTING STEEL DOOR. INTSTALLER NOTES - REMOVE EXISTING LOCK. INSTALL NEW WIRELESS LOCK AND STRIKE. ADD OR REPLACE DOOR CLOSER. ACCESS CONTROL CONNECTION AND PROGRAMMING BY DIVISION 28. WIRELESS HUB PROVIDED BY THIS SECTION - LOCATION AND QUANTITY TO BE CONFIRMED BY SITE SURVEY

Set #2A - SINGLE DOOR - NEW LOCKSET- CR

Doors: 102

1.0 Mortise Lock	L9080 06A Less Cylinder		
1.0 Electric Strike	F2164	32D	RCI
1.0 Door Position Switch	GRI 29PD		
1.0 Card Reader	BY DIVISION 28		

NOTE: REMOVE EXISTING MORTISE LOCK AND THUMBTURN, REPLACE WITH NEW STOREROOM FUNCTION LOCK, REUSE EXISTING CYLINDER. MAKE GOOD DOOR SURFACE WHERE THUMBTURN REMOVED. ADD ELECTRIC STRIKE (FAIL SECURE) AND DOOR POSITION SWITCH. CARD READER AND DOOR CONTROLLER BY DIVISION 28. POWER FOR ELECTRIC STRIKE BY DIVISION 28. LOW VOLTAGE WIRING BY DIVISION 28

Set #3A - SINGLE DOORS - LOCKSET-CR

Doors: ST-1

1.0 Cylindrical Lock	ND 80 RHO KEYED TO SUIT	626	
1.0 Electric Strike	F2164	32D	RCI
1.0 Door Closer	8616 AF86P COV	689	DK
1.0 Door Position Switch	GRI 29PD		
1.0 DOOR CONTROLLER	BY DIVISION 28		
1.0 Card Reader	BY DIVISION 28		

NOTE: EXISTING STEEL DOOR. INTSTALLER NOTES - REMOVE PASSAGE SET. INSTALL NEW LOCK AND ELECTRIC STRIKE. ADD OR REPLACE DOOR CLOSER. ACCESS CONTROL CONNECTION AND PROGRAMMING BY DIVISION 28.

Set #3B - SINGLE DOOR - EXIT DEVICE - WIRELESS TRIM

Doors: 130

1.0 Card Reader Lock	E79 N11E3DLKR00 Wireless Exit Trim	626	DK
1.0 Exit Device	8300 A 430 LD	689	DK
1.0 Wireless Lock	75428 Gateway Hub		DK
	Solutions		
1.0 Door Position Switch	GRI 29PD		
1.0 DOOR CONTROLLER	BY DIVISION 28		

NOTE: REMOVE EXISTING EXIT DEVICE AND PULL HANDLE, REPLACE WITH NEW EXIT DEVICE AND WIRELESS EXIT TRIM. PRESENTING VALID CREDENTIAL ALLOWS INGRESS VIA WIRELESS ELECTRONIC EXIT TRIM. FREE EGRESS FROM PUSH SIDE. CONECTION AND PROGRAMMING BY DIVISION 28. WIRELESS HUB BY THIS SECTION - LOCATION AND QUANTITY TO BE DETERMINED BY SITE SURVEY.

Set #4 - EXTERIOR MAIN ENTRANCE

Doors: 100-1

1.0 Electric Strike	0162	32D	RCI
1.0 Door Position Switch	GRI 29PD		
1.0 Key Switch	653 04 L2	630	SCH
1.0 Mortise Cylinder	20-001 Keyed to Suit Building System	626	

NOTE: POWER FOR ELECTRIC STRIKE BY DIVISION 28. LOW VOLTAGE WIRING BY DIVISION 28. CARD READER AND DOOR CONTROLLER BY DIVISION 28. REUSE ALL EXISTING HARDWARE. ADD ELECTRIC STRIKE TO EXISTING RIM EXIT DEVICE. DAYTIME OPERATION: DOOR UNLOCKED VIA CYLINDER DOGGING, BECOMES PUSH PULL DOOR. AFTER HOURS: DOOR IS LOCKED AND

SECURE. ENTRY VIA VALID CREDENTIAL AT CARD READER, ELECTRIC STRIKE IS ENGAGED, PULL DOOR OPEN. KEY SWITCH TURNS ON/OFF CARD READER

Set #5A - DOUBLE DOORS - MAGLOCK- CR

Doors: 116-1

2.0 Magnetic Lock	8310 SCS	28	RCI
1.0 Power Supply	DKPS-2A X FA		RCI
2.0 Door Position Switch	GRI 29PD		
1.0 Key Switch	653 04 L2	630	SCH
1.0 Mortise Cylinder	20-001 Keyed to Suit Building System	626	
1.0 Request to Exit	CM-RQE 70A		CAM
1.0 Card Reader	BY DIVISION 28		
1.0 DOOR CONTROLLER	BY DIVISION 28		

NOTE: EXISTING HARDWARE TO REMAIN - CURRENTLY ONE EXIT ONLY LEAF AND ONE PASSAGE FUNCTION EXIT DEVICE. ADD NEW MAGNETIC LOCKS TO BOTH DOORS, REQUEST TO EXIT SENSOR AND KEY SWITCH. OPERATION: KEY SWITCH DISABLES MAGNETIC LOCKS, CARD READER AND REX - DOOR IS FREE INGRESS INTO DOME VESTIBULE ON RHR LEAF, FREE EGRESS FROM DOME. AFTER HOURS: KEY SWITCH TURNS ON MAGNETIC LOCKS, REQUEST TO EXIT SENSOR AND CARD READER. INGRESS VIA VALID CREDENTIAL RELEASES MAGNETIC LOCKS MOMENTARILY FOR AUTHORIZED ENTRY. REQUEST TO EXIT SENSOR ON VESTIBULE SIDE IMMEDIATELY RELEASES MAGNETIC LOCKS FOR FREE EGRESS. ON FIRE ALARM CONDITION, POWER TO MAGNETIC LOCKS IS DISABLED FOR IMMEDIATE RELEASE. DIVISION 28 TO PROVIDE 120 VAC FOR POWER SUPPLY, BY THIS SECTION. LOW VOLTAGE WIRING, BACK BOXES, CONDUIT BY DIVISION 28. CARD READER AND DOOR CONTROLLER BY DIVISION 28. FIRE ALARM CONTACT IS REQUIRED.

Set #6 - DOUBLE DOORS CENTRE MULLION - CR

Doors: 143

1.0 Electric Strike	0162	32D	RCI
2.0 Door Position Switch	GRI 29PD		
1.0 Card Reader	BY DIVISION 28		
1.0 DOOR CONTROLLER	BY DIVISION 28		

NOTE: REUSE EXISTING HARDWARE INCLUDING EXIT DEVICES. ADD ELECTRIC STRIKE AND DOOR POSITION SWITCHES BY THIS SECTION AND CARD READER BY DIVISION 28. POWER FOR ELECTRIC STRIKE BY DIVISION 28.

END OF SECTION

PART 1 **GENERAL**

1.1 **GENERAL**

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.
- .2 This section shall be considered as minimum standard of acceptance of all sections within Division 26 and 28 of the tender documents for the contract.

1.2 **FUNCTIONAL PERFORMANCE TESTING (FPT)**

- .1 Refer to Section 26 91 13 - Testing and Verification for Functional Performance Testing (FPT).
- .2 The correction of all electrical deficiencies identified throughout the project associated with the Work shall be a condition of Substantial Performance and shall be corrected prior to achieving Substantial Performance.

1.3 **INTENT**

- .1 It is the intent of these specifications to outline the method, materials, and quality of equipment to be furnished and installed hereinafter specified and/or shown on the drawings.

1.4 **DEFINITIONS**

- .1 "CONCEALED" – electrical services and equipment in hung ceiling spaces and non-accessible chases and furred spaces.
- .2 "EXPOSED" – will mean "not concealed" as defined herein.
- .3 "PROVIDE" – means supply and install. Wherever in the Contract Documents the word "provide" is used in any form, it shall mean that the Work concerned shall include both supply and installation of the products required for completion of that part of the Work.

1.5 CODES AND STANDARDS

- .1 Do complete installation in accordance with CSA C22.1 latest edition except where specified otherwise.
- .2 Ensure that all electrical equipment is field marked to warn persons of the potential electric shock and arc flash hazards, as per CSA C22.1 latest edition, Rule 2-306.
- .3 Comply with CSA Certification Standards and Electrical Bulletins in force at time of tender submission.
- .4 Abbreviations for electrical terms: to CSA Z85-1983.

1.6 CARE, OPERATION AND START-UP

- .1 Instruct operating personnel in the operation, care and maintenance of equipment.
- .2 Arrange and pay for the 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 aspects of its care and operation.
- .4 Whenever it is proposed to make a change or changes in the design, agreement or type of equipment called for in this specification, the electrical contractor shall estimate the cost of same and submit in triplicate detailed itemized estimates of the costs of all apparatus, materials and labour entering into the change or substitution.

1.7 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 above standard without damage to equipment.

1.8 PERMITS, FEES AND INSPECTIONS

- .1 Electrical Permits.

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Furnish Certificates of Acceptance from Inspection Department and authorities having jurisdiction on completion of work.
- .4 The electrical contractor is responsible for submitting the tender drawings to the electrical utility for the purposes of plan review upon obtaining an electrical permit.

1.9 MATERIALS AND EQUIPMENT

- .1 Provide materials and equipment in accordance Division 01.
- .2 Equipment and material to be CSA certified and manufactured to standard quoted.
- .3 Factory assembled control panels and component assemblies by a CSA approved shop.
- .4 Arrange and pay for field certification by CSA, as may be required.

1.10 FINISHES

- .1 Shop finish metal enclosure surfaces by removal of rust and scale, cleaning, application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean, prime, and paint exposed hangers, racks, fastenings to prevent rusting.

1.11 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.
- .2 Panel boards are to be equipped in the factory with proper sized lugs to suit the conductor size.
- .3 All stranded conductors (including phase, neutrals, grounds and bonds) prior to terminating under device bolts are to be twisted together so as to form a single conductor.

- .4 Ensure all bonding conductors entering electrical enclosures, such as panel tubs, splitters, junction and pull boxes 150 mm x 150 mm (6 in. x 6 in.) and larger, etc. are terminated on terminal strips which are electrically continuous and fastened to the metal non-current carrying portion of the enclosure with a minimum of two bolts, c/w lock washers.

1.12 MANUFACTURER'S AND CSA LABELS

- .1 Visible and legible after equipment is installed.

1.13 WARNING SIGNS

- .1 Provide warning signs, as specified and/or to meet requirements of Inspection Department.

1.14 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centre line of equipment unless specified or indicated otherwise.
- .2 Verify mounting height of equipment before proceeding with installation.

1.15 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 Ensure no exposed wiring is left unattended.

1.16 CONDUIT AND CABLE INSTALLATION

- .1 Install cables, conduits, and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to a minimum.
- .2 All wiring and conduit are to be concealed, unless noted otherwise. Where this is not possible due to existing construction, metal surface mounted raceways are to be used. Refer to the contract documents for more detail.
- .3 Where conduits cross building expansion joints, provide conduit expansion joints with telescoping sleeve and insulated bushings.

1.17 SLEEVES AND FIRESTOPPING

- .1 Where conduits, cables and cable troughs pass through assemblies, provide firestopping.

1.18 FIELD QUALITY CONTROL

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices' program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks — the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- .2 External Agent tests not required.
- .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 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Submit test results for Engineer's review.

1.19 DRAWINGS

- .1 Electrical drawings are not intended to show structural details or architectural features.
- .2 The electrical drawings are not to be scaled.
- .3 Electrical drawings, except where dimensioned, indicate general layouts only. Investigate structural and finish conditions and the work of all other trades affecting this work and arrange work accordingly.
- .4 All electrical junction boxes must be accessible at the completion of the project. Coordinate the location of each junction box with the proposed location of mechanical services prior to installation.
- .5 Layouts on the electrical drawings are based on the specified equipment including electrical power connections, number of conductors and conduit sizes, and physical dimensions. Alternate equipment and systems proposed by the Contractor for use on this project which necessitate changes in service connections, numbers of conductors and conduit sizes to perform the specified functions may be considered by the Engineer, however, any required modifications or additions to the electrical contract or the work of other trade contractors shall be done at no additional cost to the Owner. Furthermore, if it is found that the provisions made regarding space conditions and code required clearances are not met, the right is

reserved by the Consultant to require installation of the equipment specified.

1.20 ACCESS DOORS

- .1 The electrical contractor is to provide access doors to concealed electrical junction boxes, pull boxes and miscellaneous equipment for operating, inspecting, adjusting and servicing. Access doors are to be supplied which meet or exceed the fire resistance rating of the partition or ceiling in which they are being installed.
- .2 Flush mounted 600 mm x 600 mm (24 in. x 24 in.) for body entry and 300 mm x 300 mm (12 in. x 12 in.) for hand entry unless otherwise noted. Doors to open 180 degrees, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.
- .3 Material:
 - .1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.
 - .2 Remaining areas: use prime coated steel.
 - .3 Fire rated where installed in fire rated construction.
 - .4 Provide panels in glazed tile walls of 2.5 mm (12 gauge) 304 stainless steel #4 finish, with recessed frames secured with counter-sunk flush-head screws.
 - .5 Provide panels in plaster surfaces with recessed doors with welded metal lath ready to accept plaster and with a plaster grommet for door key access.
 - .6 Provide other access doors of 2.5 mm (12 gauge), flush with concealed hinges, anchor strap and lock, all factory prime coated.
 - .7 Supply details of doors prior to installation.
 - .8 Mark all lay-in tiles that are used for access in a manner approved by the Consultant.
- .4 Installation:
 - .1 Locate so that concealed items are accessible.
 - .2 Locate so that hand or body entry (as applicable) is achieved.
 - .3 Installation is specified in applicable sections.
- .5 Acceptable Manufacturers:
 - .1 Acudor
 - .2 LeHage

- .3 SMS
- .4 Zurn

1.21 CONNECTION OF EQUIPMENT

- .1 Provide all connections required by the equipment supplied by this Division.
- .2 Provide all connections required by equipment supplied by the Owner or by other Divisions. Examine all Drawings and Specifications and identify all requirements.
- .3 Provide all necessary accessories to make connections, including flexible connectors, etc.
- .4 Install all products and services to follow building planes. Installation shall permit free use of space and maximum headroom to the satisfaction of the Consultant.
- .5 Confirm the exact location of fixtures, outlets and connections.
- .6 Install all equipment and appurtenances to allow free access for adjustment, maintenance and/or replacement.
- .7 Provide all hangers, supports and fasteners such that no undue stresses are imposed on the structure and systems. Ensure that the load onto structures does not exceed the maximum loading. Equipment supports not supplied by equipment manufacturer are to be fabricated using structural grade steel.
- .8 Exterior supports are to be galvanized, unless noted otherwise.
- .9 Install all products and services in accordance with the respective manufacturer's recommendations.
- .10 High velocity explosive activated tools shall not be used. Low velocity system types are permitted.
- .11 Provide caps and seal all open ends of installed conduits to prevent the entrance of foreign substances.
- .12 Install all services capped for future possible use such that easy access is provided for future connections.
- .13 Vacuum all electrical equipment as part of installation cleaning procedures. Electrical equipment to include but not limited to panel boards lighting fixtures, switchboard, disconnects, control units, etc.

1.22 FIELD REVIEW

- .1 The Consultant and Owner shall have access to the site at all times for review of the work.
- .2 Correct any deficiencies as they are reported during the performance of the Work.

1.23 UNIFORMITY

- .1 All equipment and materials which serve a similar function shall be from one manufacturer and one product line.

1.24 CUTTING AND PATCHING

- .1 It is the responsibility of the Electrical Contractor to provide all required cutting and patching associated with the installation of electrical systems, devices, conduit, wire, etc., unless noted otherwise.
- .2 Restore all surfaces to a finish acceptable to the Owner.

1.25 TORQUES FOR WIRE TERMINATION

- .1 For proper termination of conductors, it is very important that field connections be made properly tight.
- .2 Where possible, obtain and comply with Manufacturer's instructions on the equipment.
- .3 In the absence of Manufacturer's instructions, make terminations in conformance with the values given in Tables D6 and D7 of the 2015 CEC.

1.26 CABLE TIES AND TYE WRAPS

- .1 Cable ties and tie wraps are only permitted to be used to provide limited support for marshalling purposes only. These devices are not intended to provide the primary support for conduits or cables as required by the Canadian Electrical Code.

1.27 WORKING SPACE ABOUT ELECTRICAL EQUIPMENT

- .1 Arrange installation as required to maintain minimum working space around electrical equipment in conformance with CSA C22.1 latest edition.

1.28 LOW V.O.C. MATERIALS

- .1 All site applied coatings, adhesives & sealants must be low VOC content.

- .2 Provide Material Safety Data Sheets for all products & materials of these types incorporated into the work.

1.29 EXISTING SERVICES

- .1 The Electrical Contractor shall ensure that all electrical services around the site serving other buildings including power, telephone, fire alarm and other electrical systems and services remain operational during the course of the project and this Contractor shall be responsible for providing such temporary services by cutting off, altering, adapting, relocating and connecting existing services and disconnecting and removing such temporary or existing services upon providing new permanent services as detailed on all drawings. The site shall be examined to determine the extent of the temporary services and all co-ordination shall be made with the Owner's Representative. All costs shall be included in the Tender Price.

1.30 PROJECT COMMISSIONING

- .1 The contractor is responsible for all fees and the scope of work to obtain a third-party commissioning agent for the purposes of compliance with the ULC S1001 standard for integrated systems testing of fire protection and life safety systems.

1.31 PROJECT PHASING AND HOURS OF WORK

- .1 Refer to Instructions to Bidders for information pertaining to project phasing and hours of work. Work within occupied spaces and work causing a disruption to operations will be performed outside regular business hours as determined by the Owner.

END OF SECTION

PART 1 **GENERAL**

1.1 **GENERAL**

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 **ELECTRICAL PERMITS AND RCDD CERTIFICATES**

- .1 Prior to submitting the first progress claim, provide the following permits and certificates:
 - .1 As per Section 26 05 00 - Common Work Results for Electrical provide copies of the following electrical permits:
 - .1 Electrical Wiring Permits.

1.3 **EQUIPMENT IDENTIFICATION**

- .1 As per Section 26 05 03 - Electrical Identification submit proposed nomenclature for all Lamicoid plates for engineer's approval.

1.4 **SHOP DRAWINGS**

- .1 Sections as follows:
 - .1 All DIVISION 26 & 28 Sections.

1.5 **OPERATING AND MAINTENANCE MANUAL**

- .1 Operation and maintenance manual to be approved by, and final copies deposited with the Consultant before final inspection.
- .2 Operation data to include:
 - .1 Schematics for each system.
 - .2 Description of each system and its controls.
 - .3 Description of operation of each system.
 - .4 Operation instruction for each system and each component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Colour coding chart.
- .3 Maintenance data shall include:

- .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
- .2 Data to include schedules of tasks, frequency, tools required and task time.
- .4 Performance data to include:
 - .1 Equipment manufacturer's performance data sheets with point of operation as left after system verification is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified elsewhere.
- .5 Approvals:
 - .1 Submit two (2) copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless so directed by the Consultant.
 - .2 Make changes as required and re-submit as directed by the Consultant.
- .6 Provide maintenance data for the following:
 - .1 All DIVISION 26 & 28 Sections.
- .7 Provide one (1) copy of all approved shop drawings for each maintenance manual.

1.6 RECORD DRAWINGS

- .1 Site records:
 - .1 Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include change orders, site instructions and changes to electrical systems.
 - .2 Make available for reference purposes and inspection at all times.
 - .3 Produce record drawings in accordance with Division 1.
- .2 Where products are specified by manufacturer and/or model, update AutoCAD file to show installed manufacturer and model.
- .3 Record Drawings:
 - .1 Prior to start of Testing and System verification finalize production of as-built drawings.
 - .2 Identify each drawing in lower right-hand corner in letters at least ½" (13 mm) high as follows: - "RECORD DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED" (DATE).

- .3 Submit to Consultant for approval and make corrections as directed.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 FUNCTIONAL PERFORMANCE TESTING (FPT)

- .1 Refer to Section 26 91 13 - Testing and Verification.
- .2 The correction of all electrical deficiencies identified throughout the project associated with the Work shall be a condition of Substantial Performance and shall be corrected prior to achieving Substantial Performance.
- .3 Deficiencies discovered during the FPT process are to be immediately rectified by the Electrical Contractor. A condition of Substantial Performance shall be the correction of all electrical deficiencies identified throughout the project associated with this work.
- .4 The contractor shall return copies of the deficiency lists to Owner via the Engineer with all corrected items signed off.
- .5 The FPT Deficiency list will form part of the Substantial Performance Inspection list specified in Division 01.

1.3 CLOSEOUT DOCUMENTATION

- .1 Section 26 05 00: Common Work Results for Electrical.
 - .1 Copy of electrical permits from Utility.
 - .2 Single line electrical diagrams.
 - .3 Final Inspection certificate(s) from Inspection Authority.
- .2 Section 26 05 01: Electrical Submittals.
 - .1 Shop drawing and product data.
 - .2 Operating and Maintenance Manual.
 - .3 Spare parts.
 - .4 Record drawings.
- .3 Section 26 05 03: Electrical Identification.

- .1 Submission of proposed equipment identification Lamicoid plates for approval.
- .4 Section 26 91 13: Testing and Verification.
 - .1 Verification and Test Forms.
- .5 Section 27 10 05: Structured Cabling for Communications Systems.
 - .1 Testing and Verification Report & Certificate.

1.4 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .2 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.
- .3 Following the completion of each training and demonstration session, the contractor is to obtain an attendance sheet signed off by those personnel who have received training.
- .4 Where deemed necessary, Owner may record these demonstrations on video tape for future reference.

PART 2 PRODUCTS

2.1 N/A

PART 3 EXECUTION

3.1 N/A

END OF SECTION

PART 1 **GENERAL**

1.1 **GENERAL**

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 **IDENTIFICATION REQUIREMENTS**

- .1 All electrical equipment shall be identified by the use of Lamicoid plates.
- .2 All enclosures receiving connections to the building power distribution system shall have their panel and circuit number identified by the use of Lamicoid plates. This includes equipment supplied by the electrical contractor and all other Divisions.
- .3 All electrical junction, pull boxes and splitters shall be color coded inside and out with appropriate coloured paint. **All paint is to be applied prior to installation and not within the confines of the building.**
- .4 All conduit couplings shall be color coded with appropriate coloured paint. All paint is to be applied prior to installation and not within the confines of the building.
- .5 All junction boxes shall have the panel and circuit numbers contained within, identified on the coverplate.
- .6 All wiring shall be identified through the use of self-laminating labels.
- .7 All electrical devices, junction boxes and equipment in concealed ceiling spaces shall be identified with two (2) Lamicoid plates, one on the device, junction box and equipment and one on the ceiling below.

PART 2 **PRODUCTS**

2.1 **IDENTIFICATION NAMEPLATES**

- .1 Lamicoid identification plates.

- .1 Lamicoid 3 mm thick plastic engraving sheet for all electrical systems. Lamicoid characteristics are to be as follows, unless noted otherwise:
 - .1 Fire alarm systems to have red face with white core Lamicoid plates.
 - .2 Electrical equipment enclosures to have black face with white core Lamicoid plates.
 - .3 All ceiling mounted plates to have white face with black core.
- .2 Nameplate sizes:
 - Size 1 10 mm x 50 mm (3/8" x 2") 1 line 5 mm (0.2") high letters
 - Size 2 13 mm x 75 mm (1/2" x 3") 1 line 6 mm (0.25") high letters
 - Size 3 16 mm x 75 mm (3/4" x 3") 2 line 5 mm (0.2") high letters
 - Size 4 19 mm x 90 mm (3/4" x 3.5") 1 line 10 mm (3/8") high letters
 - Size 5 38 mm x 90 mm (1.5" x 3.5") 2 line 13 mm (1/2") high letters
 - Size 6 25 mm x 100 mm (1" x 4") 1 line 13 mm (1/2") high letters
 - Size 7 25 mm x 100 mm (1" x 4") 2 line 6 mm (1/4") high letters
 - Size 8 50 mm x 150 mm (2" x 6") 2 line 13 mm (1/2") high letters
 - Size 9 75 mm x 150 mm (3" x 6") 3 line 13 mm (1/2") high letters
- .3 Identification to be in English.

2.2 COLOUR CODING OF ELECTRICAL BOXES

- .1 The color coding of splitters, junction boxes, pull boxes and outlet boxes will follow the schedule as listed:
 - .1 Color coding of system as per the following:

System	3/4" DISC	1/4" DISC
0 to 50 volts	Violet	
51 to 240 volts	Yellow	
Ground or Bond	Green	
Fire Alarm	Red	
 - .2 All various systems junction and/or pull boxes etc., where located above grid system, shall have location identified on underside or room side of t-bar spline, with (19 mm) or (6 mm on 19 mm) self-adhering color coded circular shaped discs, affixed directly to spline in close proximity to where concealed box is located. The same type of discs to be installed on ceiling or wall access cover plates.
 - .1 6 mm (1/4") discs are all white in color.
 - .2 19 mm (3/4") discs are colored as indicated.
- .3 6 mm (1/4") to be affixed to center or middle of 19 mm (3/4") discs as system colors dictates.

- .4 All junction boxes and/or pull boxes, (and respective covers), complete with their respective cover plates as per the following:
 - .1 Inside and out where one color is required, with coverplate painted completely.
- .5 All junction boxes and/or pull boxes, where not concealed, are to have discs fastened to the outside of the box when architectural painting is complete.

2.3 WIRING IDENTIFICATION

- .1 Wiring Labels:
 - .1 Write on self-laminating labels.

PART 3 EXECUTION

3.1 EQUIPMENT IDENTIFICATION

- .1 Submit description of proposed equipment identification plates for engineer's approval.
- .2 Do not manufacture Lamicoid plates prior to receiving written approval from the engineer.
- .3 Lamicoid nameplate fastening method shall be as follows:
 - .1 Concrete or concrete block.
 - .1 Contact type cement (Note: Peel off type not acceptable).
 - .2 Plasterboard.
 - .1 Contact type cement (Note: Peel off type not acceptable).
- .4 Equipment enclosures.
 - .1 Pop rivets. (Note: Screws not acceptable).
- .5 Ceiling and T-Bar spline.
 - .1 Contact type cement (Note: Peel off type not acceptable).

3.2 IDENTIFICATION OF JUNCTION BOXES, PULL BOXES, SPLITTER TROUGHS AND OUTLET BOXES

- .1 Colour Coding
 - .1 Identification of electrical junction boxes, pull boxes, splitter troughs.
 - .1 Colour code as per 2.2.

- .2 Apply colour coding prior to pulling conductors into boxes.
 - .3 Where primary colour only is indicated:
 - .1 Color inside and outside of box.
 - .2 Color all cover plates.
 - .2 Voltage and Originating Source Identification
 - .1 Identification of electrical junction boxes, pull boxes, splitter troughs: smaller than 150 mm x 150 mm.
 - .1 Identify on the coverplate, using permanent indelible black marker the panel and circuit numbers contained with.
 - .2 Identification of electrical junction boxes, pull boxes, splitter troughs: 150 mm x 150 mm and larger.
 - .1 Provide Lamicoid plate fastened to coverplate, indicating:
 - .1 Voltage and phase.
 - .2 Originating panel.
 - .3 Size 6.
 - .4 Example: "120/208V, 3Ø, 4W, Panel 'A'."
 - .2 Using permanent indelible black marker, identify the circuits contained within.

3.3 IDENTIFICATION OF SYSTEM CONTROL PANELS

- .1 Provide Lamicoid plate fastened to equipment enclosure indicating:
 - .1 System name.
 - .2 Size 6.
 - .3 Example: "Fire Alarm Control Panel".

3.4 IDENTIFICATION OF WIRING

- .1 Identification of wiring:
 - .1 Identify wiring with permanent indelible identifying markings, either numbered or colored plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
 - .2 Labeling of all branch circuit wiring including phase conductors, neutral, ground and/or bonding conductors to be done on both ends of all circuit wires plus in any junction and/or pull boxes located in between using approved product (refer to 2.3). These labels are to be installed in a 'flagged' manner around individual conductors.
 - .3 Indicate panel and circuit number i.e.: Panel '1101', cct. #10.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

- .1 Test Requirements: ULC-S115-M or CAN4-S115-M, "Standard Method of Fire Tests of Through Penetration Fire Stops."
- .2 Underwriters Laboratories of Canada (ULC) of Scarborough runs CAN4-S115-M under their designation of ULC-S115-M and publishes the results in their "FIRE RESISTANCE RATINGS DIRECTORY" that is updated annually.
- .3 Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually. UL tests that meet the requirements of ULC-S115-M are given a cUL listing and are published by UL in their "Products Certified for Canada (cUL) Directory."
- .4 International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments
- .5 CAN/ULC-S102-M, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .6 National Building Code of Canada.
- .7 CSA C22.1 latest edition, Canadian Electrical Code, Part 1 Safety Standard for Electrical Installations.

1.4 SUBMITTALS

- .1 Submit Product Data: Manufacturer's specifications and technical data for **each material specifically** used on this project including the composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions to comply with Division 01.
- .2 Manufacturer's engineering judgment identification number and drawing details when no ULC or cUL system is available for an application. Engineer judgment must include both project name and contractor's name who will install firestop system as described in drawing.
- .3 Submit material safety data sheets provided with product delivered to job site. Submit product data in accordance with Section 26 05 01 - Electrical Submittals.
- .4 Shop drawings submission to include:
 - .1 Layout of equipment.
 - .2 Complete **PROJECT SPECIFIC** Wiring Diagrams and documentation. Include fire stopping methods specifically used on this project.
 - .3 Provide PDF copy of an operational and maintenance manual for all products being supplied.
- .5 Submit close out documents in accordance with Section 26 05 02 - Electrical Contract Closeouts.
- .6 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual. Operation and maintenance data to include:
 - .1 Operation instructions.
 - .2 Description of system operation.
 - .3 Description of each subsystem operation.
 - .4 List showing each piece of equipment in system or subsystem by its original manufacturer name and model number.
 - .5 Part list showing parts used in equipment by identification numbers that are standard to electronics industry.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect public address systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and ULC or cUL label where applicable.
- .5 Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job site.
- .6 Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.
- .7 Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- .8 Do not use damaged or expired materials.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

1.7 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

- .1 Definition of Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.
- .2 Only tested firestop systems shall be used for penetrations for the passage of cables, conduit and other electrical equipment through the following:

- .1 Fire-rated vertical barriers (walls and partitions).
- .2 Horizontal barriers (floor/ceiling assemblies).
- .3 Vertical service shaft walls and partitions.

PART 2 PRODUCTS

2.1 FIRESTOPPING, GENERAL

- .1 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- .2 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- .3 Firestopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .4 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .5 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

2.2 ACCEPTABLE MANUFACTURERS

- .1 Subject to compliance with through penetration firestop systems listed in U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory.

2.3 MATERIALS

- .1 Use only firestop products that have been ULC or cUL tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
- .2 Sealants or caulking materials for use with non-combustible items including rigid steel conduit and electrical metallic tubing (EMT), products listed in the U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory.

2.4 PENETRATIONS THROUGH A FIRE SEPARATION WALL

- .1 For penetrations through a Fire Separation wall provide a firestop system with a "F" Rating as determined by ULC or cUL as indicated below:

Fire Resistance Rating of Separation	Required ULC or cUL "F" Rating of Firestopping Assembly
30 minutes	20 minutes
45 minutes	45 minutes
1 hour	45 minutes
1.5 hours	1 hour
2 hours	1.5 hours
3 hours	2 hours
4 hours	3 hours

2.5 PENETRATIONS THROUGH A FIRE WALL OR HORIZONTAL FIRE SEPARATION

- .1 For penetrations through a Fire Wall or horizontal Fire Separation provide a firestop system with a "FT" Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.

PART 3 EXECUTION

3.1 INSTALLER QUALIFICATIONS

- .1 Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

3.2 PROJECT CONDITIONS

- .1 Do not use materials that contain flammable solvents.
- .2 Scheduling:
- .1 Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
 - .2 Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

- .3 Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- .4 Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
- .5 During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

3.3 PREPARATION

- .1 Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - .1 Verify penetrations are properly sized and in suitable condition for application of materials.
 - .2 Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
 - .3 Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
 - .4 Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
 - .5 Do not proceed until unsatisfactory conditions have been corrected.

3.4 COORDINATION

- .1 Coordinate location and proper selection of cast-in-place Firestop Devices. Ensure device is installed before placement of concrete.
- .2 Provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.5 INSTALLATION

- .1 Regulatory Requirements: Install firestop materials in accordance with ULC Fire Resistance Directory or UL Products Certified for Canada (cUL) Directory.
- .2 Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

- .1 Seal all holes or voids made by penetrations to ensure an air and water-resistant seal.
- .2 Protect materials from damage on surfaces subjected to traffic.

3.6 QUALITY ASSURANCE

- .1 A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.
- .2 Firestop System installation must meet requirements of CAN4-S115-M or ULC S-115-M tested assemblies that provide a fire rating as shown in Section 2. "Penetrations through a Fire Separation Wall" and "Penetrations through a Fire Wall or Horizontal Fire Separation" below.
- .3 Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
- .4 Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. The installer shall consult the structural engineer prior to penetrating any load bearing assembly.
- .5 For those firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (September 7, 1994).
- .6 Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- .7 Keep areas of work accessible until inspection by applicable code authorities.
- .8 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- .9 Install a warning card that is clearly visible adjacent to all large and medium openings that may be re-penetrated. This card should contain the following information:

- .1 Warning that the opening has being fire stop protected.
- .2 Indicate the fire stop system used (ULC or cUL).
- .3 F rating or FT rating.
- .4 Firestop product(s) used.
- .5 Person to contact and phone number in case of modification or new penetration of fire stop system.

3.7 ADJUSTING AND CLEANING

- .1 Remove equipment, materials and debris, leaving area in undamaged, clean condition.
- .2 Remove temporary dams after initial set of fire stopping and smoke seal materials.
- .3 Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.8 COMMISSIONING

- .1 Carry out the commissioning in conformance with Section 26 91 13 - Testing and Verification.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED SECTIONS

- .1 Section 26 05 21 - Wires and Cables 0-1000V.
- .2 Section 26 05 29 - Hangers and Supports.
- .3 Section 26 05 32 Outlet Boxes, Conduit Boxes and Fittings.
- .4 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

- .1 CSA C22.2 No.65-18 Wire Connectors.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 26 05 01 - Electrical Submittals.
- .2 Shop drawings submission to include:
 - .1 Layout of equipment.
 - .2 Complete **PROJECT SPECIFIC** Wiring Diagrams and documentation.
 - .3 Provide PDF copy of an operational and maintenance manual for all products being supplied.
- .3 Submit close out documents in accordance with Section 26 05 02 - Electrical Contract Closeouts.
- .4 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual. Operation and maintenance data to include:
 - .1 Operation instructions.
 - .2 Description of system operation.

- .3 Description of each subsystem operation.
- .4 List showing each piece of equipment in system or subsystem by its original manufacturer name and model number.
- .5 Part list showing parts used in equipment by identification numbers that are standard to electronics industry.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect public address systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Use T & B 3310 AC90 type connectors for all branch circuit wiring sized #10 AWG AC90 and smaller. Current carrying parts are to be made of copper or copper alloy and be complete with an appropriate size insulating cap. Cap is to completely fit, or cover all enclosed conductors as required, with current carrying parts of sized to fit conductors as required.

- .2 Spring type pressure connectors for all branch circuit wiring sized at #10 AWG and smaller. Current carrying parts are to be made of copper or copper alloy and be complete with an appropriate size insulating cap. Cap is to completely fit, or cover all enclosed conductors as required, with current carrying parts of size to fit conductors as required.

PART 3 **EXECUTION**

3.1 **INSTALLATION**

- .1 Remove insulation carefully from ends of conductors.
- .2 All wire connectors are to be "plier-tightened". Finger tight is not acceptable.
- .3 Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
- .4 Use T & B 3310 AC90 wire connectors for all branch circuit wiring sized #10 AWG AC90 and smaller. Current carry parts are to be made of copper or copper alloy and be c/w an appropriately sized insulating cap. Cap is to be completely fit, or cover all enclosed conductors as required.
- .5 Bushing stud connectors are not acceptable.
- .6 All wire connectors are to be plier-tightened. Finger-tight is not acceptable.

3.2 **COMMISSIONING**

- .1 Carry out the commissioning in conformance with Section 26 91 13 - Testing and Verification.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED SECTIONS

- .1 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No.38-18 Thermoset-insulated wires and cables (Trinational standard with UL 44 and ANCE NMX-J-451).
 - .2 CSA-C22.2 No.51-20 Armoured Cables.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 26 05 01 - Electrical Submittals.
- .2 Shop drawings submission to include:
 - .1 Layout of equipment.
 - .2 Complete **PROJECT SPECIFIC** documentation.
 - .3 Provide PDF copy of an operational and maintenance manual for all products being supplied.
- .3 Submit close out documents in accordance with Section 26 05 02 - Electrical Contract Closeouts.
- .4 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual. Operation and maintenance data to include:
 - .1 Operation instructions.
 - .2 Description of system operation.
 - .3 Description of each subsystem operation.
 - .4 List showing each piece of equipment in system or subsystem by its original manufacturer name and model number.

- .5 Part list showing parts used in equipment by identification numbers that are standard to electronics industry.

1.5 DELIVERY, STORAGE AND HANDLING

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- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect public address systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

PART 2 PRODUCTS

2.1 BUILDING WIRES

- .1 Unless otherwise noted, all conductors (phase, neutral, bond, isolated ground) installed on this project shall be stranded, soft drawn copper, of 98% conductivity rated at 600 volts, with RW90 XLPE insulation rated for a minimum of 600 VAC. The minimum wire size will be #12 AWG.
- .2 Existing conductors shall be reused if in good condition and tested for shorts.
- .3 Unless noted otherwise, phase colour coding as per CSA C22.1 latest edition rule 4-032, will apply.

- .4 All phase conductors sized from #12 AWG up to and including #2 AWG to have appropriate coloured insulation (red, black & blue).
- .5 All neutral, grounds and/or bond conductors sized #12 AWG up to and including #3/0 AWG to have appropriate colored insulation (white or green).
- .6 Feeders fed from an overcurrent device rated up to and including 100A are to utilize copper conductors. Feeders fed from an overcurrent device rated above 100A may utilize aluminum conductor material (ACM). Ensure the use of the of a wire brush, joint compound, and proper torque wrench.
- .7 Current carrying and neutral conductors for all systems rated 600 volts and less, shall have RW90-XLPE type insulation rated accordingly.
 - .1 The supply and installation of 1000 volt rated conductors shall be considered only where equipment manufactures or other applications warrants same.
- .8 Grounding and bonding conductors sized up to and including #10 AWG, are to have green colored RW90 X-link insulation. Type TW75 c/w green colored insulation is acceptable for all sizes #8 AWG and larger.
- .9 The tie-wrapping of the neutral conductor with its respective phase conductors is to be made at the closest point of entry "within" all panelboards, pull boxes, junction boxes, outlet boxes, etc.
- .10 All branch circuits which do not have neutral conductors, are to have their respective phase conductors tie-wrapped together in accordance with previously described methods.
- .11 The use of NMD-90 is prohibited unless prior approval is granted by the engineer and/or facility owner.
- .12 AC90 (BX) cable is permitted for use for drops to light fixtures. ISO AC90 with separate insulated green ground wires (Minimum #12 AWG) in addition to the bare ground may used within rooms that are noted as patient care areas and that have hospital grade devices. Feeder connections to all other devices to be within conduit.
- .13 Provide fire alarm cable and speaker cable as indicated on drawings.

PART 3 EXECUTION

3.1 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
 - .2 All stranded conductors, (neutrals, bonds and phase conductors) prior to terminating under device bolts to be twisted together so as to form a single conductor.
 - .3 Neutrals for all circuits are to be dedicated; no shared neutrals.
 - .4 All cables are to be secured to concrete, concrete block, brick, metal decking/sliding, with nylon type inserts c/w self-tapping metal screws.
 - .5 Pliable type cables are to be secured to building structure at 4' intervals, and tie-wrapped together at mid-point between each structure support.
 - .6 All branch circuit phase and/or neutral conductors are to be "Megger" tested for insulation resistance utilizing the following type meter:
 - .1 500-volt meter for conductor insulation rating up to 500 volts.
 - .2 1000-volt meter for conductor insulations rated above 500 volts.

3.2 VOLTAGE DROP

- .1 The contractor shall run all branch circuits so that the voltage drop in no instance exceeds 3% of the line voltage. The following table is to include both vertical and horizontal lengths of conductor runs. Minimum size of branch circuit neutral where phase sharing occurs, shall not be smaller than #10 AWG. Minimum size of branch circuit neutral where dedicated to its own branch circuit phase conductor shall not be less than #12 AWG. Note that minimum size #10 AWG bond conductors to accompany #8 branch circuit conductors.

- .2 THE FOLLOWING TABLE SHALL BE STRICTLY ADHERED TO:

Branch Circuit Length of Run	Phase Wire Size	Dedicated Neutral	Shared Neutral Size	Bond Wire Mm (feet)
Up to 24,384 (80)	#12	#12	#10	#12
Up to 38,100 (125)	#10	#10	#8	#12
Up to 56,390 (185)	#8	#8	#6	#10

- .3 Oversized #10 AWG branch circuit wiring conductors to be extended to outlet box of device they feed (including switch legs). Oversized #8 AWG branch circuit wiring conductors to be extended from panelboard to junction box located on wall or ceiling directly above wall light switches and/or receptacles. #8 AWG wire to be reduced to #10 AWG for vertical portion of drop only.

3.3 CONTROL CIRCUIT WIRING 50 VOLTS AND LESS

- .1 The installation of surface wiring on walls or open type ceiling, shall be in EMT type conduit c/w associated "steel" type connectors and couplings.
- .2 EMT conduits are to be extended to within 30" of all various control devices associated with the operation of any given piece of mechanical equipment or device they might feed.
- .3 Unless specifically indicated otherwise, liquid tight flexible metal conduit c/w matching liquid tight connectors are to be used for final connections between end of EMT conduit and applicable control device. A junction or pull box may also be utilized to make the transition.
- .4 EMT type conduit "wall-stub" c/w flush installed device box shall be located in all partitions to accommodate wiring between the device and the associated ceiling space.
- .5 EMT connectors c/w nylon insulated throat or threaded type bushing shall be installed on end of EMT stub where it protrudes through wall "above", and within finish accessible type ceiling. EMT plastic end cap bushing that are CSA approved may also be used.
- .6 All EMT conduit stubs are to be bonded to ground as required by CEC.

3.4 TESTING

- .1 After all electrical wiring has been completed by the electrical subcontractor, they are to test the grounded electrical distribution system to ensure there are no grounds, shorts, and capacitive leakage in the system.

3.5 COMMISSIONING

- .1 Carry out the commissioning in conformance with Section 26 91 13 - Testing and Verification.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED SECTIONS

- .1 Section 26 05 21 – Wire and Cables 0-1000V.
- .2 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

- .1 CSA 22.2 No. 41:22 Grounding and bonding equipment (Trinational standard with NMJ-J-590- ANCE and UL 467).

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 26 05 01 - Electrical Submittals.
- .2 Shop drawings submission to include:
 - .1 Layout of equipment.
 - .2 Complete **PROJECT SPECIFIC** Wiring Diagrams and documentation.
 - .3 Provide PDF copy of an operational and maintenance manual for all products being supplied.
- .3 Submit close out documents in accordance with Section 26 05 02 - Electrical Contract Closeouts.
- .4 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual. Operation and maintenance data to include:
 - .1 Operation instructions.
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 - .3 Description of each subsystem operation.

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- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect public address systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

PART 2 PRODUCTS

2.1 GROUND WIRING AND CONNECTORS

- .1 All ground wiring indicated to be green in colour shall meet the CSA C22.2 No.38 Thermoset-insulated wiring and cables standard and CSA C22.2 No. 42:22 Grounding and bonding equipment (Trinational standard with NMX-J-590- ANCE and UL 467). Conductor sizing shall be sized at minimum to meet CSA C22.1-21 Table 16.
- .2 Bare ground wiring shall meet CSA C22.2 No. 42:22 Grounding and bonding equipment.

- .3 All wire connectors, fitting and clamps shall be provided to complete electrical grounding of all electrical system and subsystems for the building, 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.

2.2 GROUND BARS

- .1 Ground Busbars: ¼" electro-tinplated copper, complete with insulators, stainless steel wall brackets and fasteners.

2.3 COMPRESSION PASS THROUGH CONNECTORS FOR GROUND BARS

- .1 Where pass through connectors are required throughout this specification, the contractor can choose one of two options:
 - .1 Option One: Exothermic welding.
 - .2 Option Two: High conductivity, wrought copper alloy, bus bar connector.
- .2 Where Option Two is the chosen method, the following product is to be used:
 - .1 High conductivity wrought copper alloy, bus bar connector. Conductor and busbar grooves filled with Penetrox for better conductivity. cUL listed and stamped.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

- .1 All equipment and exposed non-current carrying metal, conduits and parts to be permanently and effectively grounded to meet minimum requirements of the CSA C22.1 latest edition section 10 and as indicated on drawings and further specified. Standards set either by drawings or specifications which are above those covered by the CSA C22.1 latest edition section 10 are not to be reduced under any circumstances.

- .2 All grounding and bonding requirements shall be in accordance with all applicable CSA C22.1 latest edition and standards described in tender documentation, whichever is more stringent.
- .3 Install complete permanent, continuous bonding system including conductors, connectors, and accessories. Where EMT is used, install bonding conductor in each and every conduit.
- .4 Install connectors in accordance with the manufacturer's instructions.
- .5 Protect exposed grounding conductors from mechanical injury.
- .6 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .7 Soldered joints not permitted.
- .8 All conduit for all electrical systems is to contain a minimum #12 AWG copper bond wire. Bonding jumpers are permitted for conduit stubbed into a T-bar ceiling. All metallic conduit stubs shall be bonded regardless of length.
- .9 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw.
- .10 Make grounding connections in radial configuration only. Avoid loop connections.
- .11 All other various systems' electrical ground connectors are take place on the ground bus with "compression" type lugs. Lugs are to be as follows.
 - .1 Copper, one-hole, long barrel (single crimp) type lugs are to be used for all wire size up to and including #6 AWG.
 - .2 Copper, two-hole, long barrel (dual crimp) type lugs are to be used for all wire sizes #4 AWG and larger.
 - .3 To be bolted to bus bar utilizing concave, or combination of flat and locking type washers c/w accompanying hardware as may be required.
 - .4 Use approved "bronze or copper" type ground connectors (as required) for terminating main incoming service entrance ground conductor directly to wall ground bus.
- .12 All cables, feeders and branch circuit conductors installed in conduit are to be c/w a separate minimum size #12 (solid) AWG copper bond/ground wire as follows:

- .1 Where bond wires sizes larger than #12 AWG are required, they are to be increased as required by CSA C22.1 latest edition table 16, or as otherwise noted.
- .2 No. 12 AWG and larger size ground or bond conductors shall be of soft drawn stranded copper of 98% conductivity, and of full size and AWG gauge.
- .3 Size of bond conductor is to be based upon Table 16 of CSA C22.1 latest edition.
- .4 Size of ground conductor is to be minimum #6 AWG.
- .5 Minimum size #12 AWG solid ground insulated conductors are acceptable for bonding purposes associated with various other systems rated at 50 volts or less.
- .13 The feed bonding conductor shall be secured (wrapped around unbroken) to the grounding screw of each outlet/device box, before connecting to the other ground conductors, and/or providing a "pig-tail" lead for device terminations.
- .14 All ground wires are to be twisted together with a screw-on type wire connector, and then placed in rear of outlet box in such manner as to minimize obstructions.

3.2 COMMISSIONING

- .1 Carry out the commissioning in conformance with Section 26 91 13 - Testing and Verification.

END OF SECTION

PART 1 **GENERAL**

1.1 **GENERAL**

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 **RELATED SECTIONS**

- .1 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Section 26 05 21 – Wire and Cables 0-1000V

1.3 **REFERENCES**

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 18.4:15(R2019) Hardware for the support of conduit, tubing, and cable (Bi-national standard with UL 2239).

1.4 **SUBMITTALS**

- .1 Submit product data in accordance with Section 26 05 01 - Electrical Submittals.
- .2 Shop drawings submission to include:
 - .1 Layout of equipment.
 - .2 Complete **PROJECT SPECIFIC** Wiring Diagrams and documentation.
 - .3 Provide PDF copy of an operational and maintenance manual for all products being supplied.
- .3 Submit close out documents in accordance with Section 26 05 02 - Electrical Contract Closeouts.
- .4 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual. Operation and maintenance data to include:
 - .1 Operation instructions.
 - .2 Description of system operation.

- .3 Description of each subsystem operation.
- .4 List showing each piece of equipment in system or subsystem by its original manufacturer name and model number.
- .5 Part list showing parts used in equipment by identification numbers that are standard to electronics industry.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect public address systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

- .1 U shape, size 45 mm x 45 mm, 3 mm thick, surface mounted as required.

2.2 BEAM CLAMPS

- .1 Beam clamp for 10 mm threaded rod to be malleable iron, complete with hardened steel cup point set screw. Rated for a minimum of 227 Kg (400 pounds).
- .2 Taylor Pipe Support, Wide Mouth Top Beam Clamp #407, or equal.
- .3 Push-on type conduit clips are not to be used on this project.

2.3 ATTACHMENT FOR THREADED RODS TO METAL DECK

- .1 Threaded fastener with expandable sleeve with ULC listed for direct attachment of threaded rod in metal deck (22-16 gauge).
- .2 Standard of acceptance to be Sammy X-Press.
- .3 Threaded rod anchors such as Hanger mate type are not to be used on this project.

2.4 ARMoured CABLE STRAPS

- .1 Aluminum alloy with cUL listed for armoured cable application.
- .2 Standard of acceptance to be Iberville cat# C10/C15 with equal by:
 - .1 Hubbell.
 - .2 Legrand.
- .3 Push-on type cable clips are not to be used on this project.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Secure equipment to hollow and solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Support equipment, conduit or cables using clips, spring-loaded bolts, cable clamps designed as accessories to basic channel members.
- .4 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole steel straps to secure surface conduits and cables 35 mm (1 ¼ inch) and smaller.
- .2 Two-hole steel straps for conduits and cables 41 mm (1 ½ inch) and larger.
- .3 Beam clamps to secure conduit to exposed steelwork.
- .5 Suspended supports systems.
 - .1 Support single or multiple cables or conduits on a common steel support channel system supported by 10 mm (3/8") diameter threaded rod hangers, washers and nuts where direct fastening to building construction is impractical. Channel is to be sandwiched between nuts and washers located on both upper and underside portions of channels.
 - .2 Do not support a single conduit using a threaded rod and a conduit clip. This is not an acceptable means of installation as no lateral support is provided.
- .6 For surface mounting of single and multiple conduits use channels. Channels are to be securely attached to hangers with the maximum spacing not greater than:
 - .1 Conduits of one size only:
 - .1 16 mm to 21 mm (½" to ¾") conduit 1524 mm (60").
 - .2 27 mm & 35 mm (1" to 1 ¼") conduit 1980 mm (78").
 - .3 41 mm (1 ½") & larger conduit 3050 mm (120").
 - .2 Conduits of mixed size:
 - .1 Arrange supports so that maximum spacing of supports conforms to above, based on smallest conduit diameter.
- .7 All suspended types of junction and pull boxes are to be supported using a minimum of 10 mm (3/8") threaded rod c/w nuts and flat washers. Secure threaded rods to boxes using one flat washer and nut installed on both sides of box. Provide as follows:
 - .1 One rod required for all types of boxes sized 150 x 150 mm (6 x 6 inches) or smaller.
 - .2 Two rods required for all types of boxes larger than 150 x 150 mm (6 x 6 inches) but less than 304 x 304 mm (12 x 12 inches).
 - .3 Four rods required for all types of boxes 304 x 304 mm (12 x 12 inches) and larger.
- .8 All excess rod is to be cut-off within 13 mm (½") of channel bottom.

- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed by other trade contractors for conduit or cable support except with permission of other trade and approval of Engineer.
- .13 Do not attach electrical conduit to supports installed as part of a suspended ceiling installation (gypsum board or T-Bar for example).
- .14 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .15 Various suspended types of outlet, pull and/or junction boxes including conduits, are to be supported with minimum size 3/8" threaded rod, nuts and flat washers. Threaded rods are to be secured to boxes with one flat washer and nut installed on both sides of box.
 - .1 One rod required for all types of boxes sized 6" x 6" ... 36 sq. inches and smaller.
 - .2 Two rods required for all types of boxes sized larger than 36 sq. inches, up to, and including those sized 12" x 12" ... 144 sq. inches.
 - .3 Minimum of four rods required for all boxes sized larger than 144 sq. inches.
- .16 EMT shall be securely fastened in place within 1m of each outlet box, junction box, pull box, cabinet or conduit fitting, with spacing between supports as per the C.E.C. Securing of surface and concealed conduits to structure for sizes up to and including 1 1/4" diameter may be done utilizing one-hole steel straps. Two-hole steel straps for all sizes 1 1/2" and larger. Grouped or singularly suspended conduits of all sizes to be supported with minimum sized 3/8" threaded rods and concrete shields. Where possible, two or more suspended type conduits shall be secured to a common steel support channel system and are to be suspended utilizing minimum size 3/8" threaded rods, washers and nuts. Channel is to be sandwiched between nuts and washers located on both upper and underside portions of channels.

- .17 All excess rod is to be cut-off within $\frac{1}{2}$ " of channel bottom. In addition to CSA C22.1 latest edition minimum conduit spacing requirements, all suspended conduit runs containing horizontal or vertical elbows are to have one additional support rod installed not greater than 12" from midpoint of "all" 90E bends. Maximum spacing between conduit support channels shall be as dictated by smallest size conduit(s) being supported and/or secured to same.
- .18 The use of tye-wraps for "supporting" purposes, is strictly prohibited and will be strictly enforced. They may "only" be utilized to secure various systems wiring "in-place," but in no instance are they to be used as a substitute for approved type metal straps, clamps, etc.

3.2 COMMISSIONING

- .1 Carry out the commissioning in conformance with Section 26 91 13 - Testing and Verification.

END OF SECTION

PART 1 **GENERAL**

1.1 **GENERAL**

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 **RELATED WORK**

- .1 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

PART 2 **PRODUCTS**

2.1 **OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1 latest edition.
- .2 100 mm (4 inch) square or larger outlet boxes as required for special devices.
- .3 Multi-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 or voltage are grouped.
- .6 Where tile rings are installed on this project, they must be the welded type with square corners (Rounded corners will not be acceptable). For single device installations use Iberville # BC52-C-49XX or approved equal. For two device installations use Iberville # 52-C-52-XX or approved equal. Select appropriate depth of tile ring to suit application.
- .7 Adjustable type tile rings of any type are not permitted on this project.
- .8 Sectional type boxes are not to be used with rigid galvanized steel conduit, "thickwall" type PVC, or "thickwall" EMT conduit. Sectional type boxes are only to be used with flexible conduit, AC-90, and/or other types of pliable cables, including those associated with other systems rated less than 50 volts.

- .9 Boxes connected to AC90 cables are to be specifically made for this purpose. Dual rated boxes (AC90/NMD90, etc.) are not acceptable.

2.2 SHEET STEEL DEVICE BOXES

- .1 One or Two Device, Flush Installation, Suitable for Conduit Entry:
 - .1 Electro-galvanized steel single, flush device boxes for use in dry flush installation, shall be pressed steel, minimum size 100 mm (4 inch) square x 54 mm (2.125 inch) deep, minimum volume of 490 cubic centimetres (30 cu.in.), (similar to Iberville # 52171-K or approved equal). Provide single device square cornered tile cover (similar to Iberville # BC52-C-49XX or approved equal) or two device square cornered tile covers (similar to Iberville # 52-C-52-XX or approved equal).

2.3 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi-gang boxes for devices flush mounted in exposed block walls, minimum volume of 343 cubic centimetres (21 cu.in), 89 mm (3.5 in.) deep, to be Iberville #MBD or approved equal.

2.4 SURFACE MOUNT CONDUIT BOXES

- .1 Cast FS aluminum boxes with factory-threaded hubs and mounting feet for surface wiring devices installed lower than 8' AFF.
- .2 Metal type "FS" device plates to be used on all type "FS" boxes unless noted otherwise. Covers are to be specifically made for boxes and to utilize 4-point fastening.
- .3 Surface boxes intended to be used for housing 347-volt lighting switches are to cast steel, type FS or FD, and "stamped" by manufacturer as being suitable for this particular voltage. Matching FS steel devices plate is to also have 347 volt stamped into face of same. Where installed higher than 8' A.F.F., metal type 1110-HV boxes c/w matching orange coloured metal switch plates may be used.
- .4 Tile type extension rings are not to be used on boxes that are surface mounted.

2.5 FLUSH MOUNT CONDUIT BOXES

- .1 When installing flush boxes in metal drywall partition where the grouping of multiple device boxes is required, support the box between the studs with a box mounting bracket. Caddy RBS series box mounting brackets or

Caddy SGB series box brackets or equal are approved for this application. Where a single flush box is installed, this box may be supported by the wall stud without any additional support required.

- .2 Flush installed 4" square, or a 4-11/16" square box being used as a junction or pull box that requires a blank metal coverplate, is have an appropriate sized, square welded one or two gang "tile ring" installed on same. This permits the use of a standard, one or two gang blank finish metal coverplate to be used, and avoids the necessity of acquiring an oversized, custom made coverplate.

2.6 FITTINGS – GENERAL

- .1 Knock-out fillers to prevent entry of foreign materials.
- .2 Double locknuts and insulated bushings on sheet metal boxes.
- .3 Conduit fittings "LB, LL, LR" and their respective covers/plates are to be painted with appropriate colour coding and where concealed, have their locations identified with appropriate colour coded self-adhering discs applied to T-Bar splines and/or access opening frames in same manner as required for identifying concealed junction and/or pull boxes.
- .4 The use of either, corner pulling "Ells" or corner pulling "Elbows" in lieu of acceptable "conduit" fittings is strictly prohibited.

2.7 COLOUR CODING

- .1 Colour coding of system as per Section 26 05 03 - Electrical Identification.

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 construction material.
- .3 For flush installations mount outlets flush with finished wall using tile rings to permit wall finish to come within 6 mm ($\frac{1}{4}$ ") of opening.
- .4 The front edges of boxes, cabinets and fittings installed in noncombustible walls or ceilings shall not be set in more than 6 mm ($\frac{1}{4}$ ").

- .5 The front edges of boxes, cabinets and fittings installed in combustible walls (i.e. millwork) shall be flush with surface.
- .6 Provide correct size of openings in boxes for conduit, mineral insulated and armored cable connections. Reducing washers not to be used.
- .7 Install multi-gang boxes where more than one device is required. Sectional (gangable) boxes are not to be used on this project.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED SECTIONS

- .1 Section 26 05 28 - Grounding and Bonding.
- .2 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .3 Section 26 05 29 – Hangers and Supports.

1.3 REFERENCES

- .1 Canadian Standards Association
 - .1 CAN/CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-M1981 (R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985 (R2003), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-M1984 (R2003), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 26 05 01 - Electrical Submittals.
- .2 Shop drawings submission to include:
 - .1 Layout of equipment.
 - .2 Complete **PROJECT SPECIFIC** Wiring Diagrams and documentation.

- .3 Provide PDF copy of an operational and maintenance manual for all products being supplied.
- .3 Submit close out documents in accordance with Section 26 05 02 - Electrical Contract Closeouts.
- .4 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual. Operation and maintenance data to include:
 - .1 Operation instructions.
 - .2 Description of system operation.
 - .3 Description of each subsystem operation.
 - .4 List showing each piece of equipment in system or subsystem by its original manufacturer name and model number.
 - .5 Part list showing parts used in equipment by identification numbers that are standard to electronics industry.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect public address systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

PART 2 PRODUCTS

2.1 CONDUITS

- .1 Rigid galvanized steel threaded conduit: size as indicated.
- .2 Electrical metallic tubing (EMT): with couplings, size as indicated.
- .3 Liquid-tight flexible metal conduit: size as indicated.
- .4 PVC conduit for underground use.
- .5 ENT conduit is not permitted for use on this project.

2.2 CONDUIT FASTENINGS

- .1 Fasten conduit to building construction or support system using straps, as follows:
 - .1 One-hole steel straps to secure surface conduits and cables 35 mm (1 ¼ inch) and smaller.
 - .2 Two-hole steel straps for conduits and cables 41 mm (1 ½ inch) and larger.
- .2 Beam clamps to secure conduits to exposed steelwork.
- .3 Channel type supports for one or more conduits.
- .4 10 mm (3/8 inch) diameter threaded rods to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating same as conduit.
- .2 Unless otherwise noted, steel set screw type fittings shall be use on EMT. Rigid conduit fitting bodies made of alloys or malleable types of metals or not to be used.
- .3 Conduits exiting equipment enclosures equipped with sprinkler hoods shall be installed with rain tight EMT connectors. These connectors will be equipped with a rubber "O" Ring gasket. In addition, any conduit couplings in the vertical portion of the conduit run over equipment enclosures equipped with sprinkler hoods shall be rain tight.
- .4 Connectors for thin wall type EMT conduits shall be set screw, galvanized steel, c/w case hardened steel locknuts. Insulated throats are to be provided on connectors up to and including 27 mm (1 inch). Metal thread

on bushings to be installed on all EMT connectors sized 35 mm (1 ¼ inch) or larger.

- .5 Flexible metal conduit connectors shall be nylon insulated, steel or malleable iron type similar to T & B Tite-Bite #3115 through 3124 or approved equal. Provide insulating bushings (anti-shorts) for flexible metal conduit connectors. Plastic thread on bushings to be installed on all flexible metal conduit connectors sized 35 mm (1 ¼ inch) or larger.
- .6 Liquid-tight flexible metal conduit fittings:
 - .1 Specifically listed for liquid tight flexible metal conduit.
 - .2 Steel type, to match conduit size.
 - .3 Fittings must incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening.
 - .4 Safe edge ground type.
 - .5 Connectors shall have insulated throats.
 - .6 T & B #5300 series or approved equal.

2.4 FISH CORD

- .1 Polypropylene.

PART 3 EXECUTION

3.1 LOCATION OF CONDUIT

- .1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

3.2 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 Where construction consists of metal Q deck and steel joists, conduits are to be installed in such a manner that the conduit system including fittings is not less than 38mm (1.5 inch) from the nearest surface of the metal roof deck.
- .4 Use rigid galvanized steel threaded conduit where subject to injury.

- .5 Use electrical metallic tubing (EMT) for the following:
 - .1 All exposed wiring.
 - .2 Where noted elsewhere in the contract documents.
- .6 EMT shall be installed as a complete system and shall be securely fastened in place within 300 mm (12 inch) of each outlet box, junction box, cabinet, couplings, fittings and changes in direction and the spacing between supports as follows:
 - .1 Not greater than 1500 mm (five feet) for 16 mm (½ inch) and 21 mm (¾ inch) EMT.
 - .2 Not greater than 1800 mm (six feet) for 27 mm (1 inch) and 35 mm (1 ¼ inch) EMT.
 - .3 Not greater than 3050 mm (ten feet) for 41 mm (1 ½ inch) EMT or larger.
- .7 All conduit runs shall be a maximum of 30 meters (100 feet) in length with a maximum of four (4) 90-degree bends between pull points. A pull box shall be placed in conduit runs where the sum of the bends exceeds 360 degrees, where the overall run exceeds 30 meters (100 feet) or there is a reverse bend in the run.
- .8 Pull boxes shall be placed in straight sections of conduit run and shall not be used in lieu of a bend.
- .9 The use of corner pulling ELLs or corner pulling elbows (conduit fittings [LL, LB, LR]) in lieu of pull boxes is not permitted.
- .10 Conduits shall be installed in a neat and ordered manner. When installed in a group, conduits shall be parallel and evenly spaced apart.
- .11 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .12 Mechanically bend steel conduit over 19 mm (¾ inch) diameter.
- .13 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .14 Install fish cord in empty conduits.
- .15 Where conduits become blocked, remove and replace the blocked section.
- .16 Dry conduits out before installing wire.

- .17 The installation of conduits above the structure, directly below roof insulation is strictly prohibited.
- .18 All conduits to be complete with a minimum of #12 green insulated bond conductor.
- .19 Ensure all metal raceways are bonded to ground, including those used for communication systems, fire alarm systems. Where a separate bonding conductor is run to a bonding bushing on an open end of a metal raceway, a #6 green RW90 shall be used.
- .20 Liquid seal flexible conduit, not smaller than 3/8" inside diameter, up to a maximum length of 15' with bond and bushing, shall be used for final connections to all vibrating and/or mechanical equipment, including various systems controls and related devices, sprinkler system devices, etc.
- .21 Steel type connectors are to be used on flexible type conduits. Malleable type connectors are not permitted.
- .22 EMT conduit stub is to be off-set out of wall into accessible ceiling space of room containing flush installed device box, and have steel EMT connector complete with plastic or grounding type bushings "screwed" on same. EMT plastic end cap bushings that are CSA approved may also be used.
- .23 All EMT conduit wall stubs and associated boxes are to be adequately bonded to ground as per CEC requirements.

3.3 SURFACE AND CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Run conduits in flanged portion of structural steel.
- .3 Group conduits wherever possible.
- .4 Do not pass conduits through structural members except as indicated.
- .5 Do not locate conduits closer than 75 mm (3 inch) parallel to hot water lines with a minimum of 25 mm (1 inch) at crossovers.
- .6 Support of electrical systems raceway shall be independent of any type of suspended ceiling support rods, wires, etc. Toggle bolts shall not be used in Gypsum board construction.
- .7 EMT conduit to be used for installation in unfinished areas.

- .8 Use aesthetic type surface raceway in finished areas where it is impossible to conceal conduits.
- .9 Wall mounted conduit/raceway is secured directly to, or directly on, exposed walls.
- .10 AC90 and/or other types of system pliable cabling are not to be installed on exposed walls and/or ceiling without the benefit of conduit/raceway.
- .11 Ceiling mounted conduit/raceway is to be secured directly to overhead structure and/or related structural steel as high as possible in the ceiling space, and as close as practicable to the underside of the deck.

3.4 CONCEALED CONDUITS

- .1 Do not install horizontal runs in masonry walls.
- .2 Do not install conduits in terrazzo or concrete toppings.
- .3 Vertically installed EMT conduit stubs from flush installed device boxes are to be provided in all block or concrete block walls.

3.5 COMMISSIONING

- .1 Carry out the commissioning in conformance with Section 26 91 13 - Testing and Verification.

END OF SECTION

PART 1 **GENERAL**

1.1 **GENERAL**

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.
- .2 The project shall have commissioning completed to the CSA Z320-11(R2021) standard.
- .3 The verification of all electrical systems installed on this project is the responsibility of the Electrical Contractor. Manufactured systems or components shall be commissioned by factory trained technicians representing the manufacturer, in the presence of the Owner's designated representatives, and under the direction of the electrical contractor.
- .4 The electrical contractor will aid the Owner's representatives and ensure that the manufacturer's representative is on site during functional performance testing (FPT).
- .5 Tests shall be performed by qualified electricians or technicians as required by the nature and complexity of the test.
- .6 The correction of all electrical deficiencies identified throughout the project associated with this work shall be a condition of Substantial Performance and shall be corrected prior to achieving Substantial Performance.
- .7 The contractor is responsible for all fees and the scope of work to obtain a third-party commissioning agent for the purposes of compliance with the ULC S1001 standard for integrated systems testing of fire protection and life safety systems.

1.2 **RELATED WORK**

- .1 General requirements: Division 01.

1.3 **SCOPE**

- .1 Systems verifications are called for throughout the individual specifications, however, this does not relieve this section from providing all

testing and verification necessary to ensure that systems and equipment operate as required and that they interface with other systems and equipment as required.

1.4 QUALITY ASSURANCE

- .1 The Electrical Contractor is responsible for quality assurance and whenever necessary, to ensure compliance with operating requirements, CSA, these contract documents, the Authority having Jurisdiction and other requirements and codes as applicable.

1.5 CONTRACTOR'S RESPONSIBILITIES

- .1 Prepare each system for testing and verification.
- .2 Coordinate the efforts of testing and verification.
- .3 Provide personnel, operate systems at designated times, and under conditions required for proper testing and adjusting.
- .4 Provide all necessary test and calibration equipment, temporary facilities, meters, sensors, load banks, etc. necessary to simulate and verify correct operating conditions.
- .5 Coordinate and pay for all costs associated with testing and verification, including but not limited to costs for: travel, labour, equipment, testing agencies, manufacturers, testing and any other costs incurred to test and verify equipment and systems.
- .6 Make test instruments available to Engineer to facilitate spot checks during testing.
- .7 Retain possession of test instruments and remove at completion of services.
- .8 Verify system installation is complete and in continuous operation.
- .9 Where systems or equipment do not operate as required, make the necessary corrections or modifications, re-test and re-commission.

1.6 SUBMITTALS

- .1 The Contractor shall submit the following documentation prior to FPT:
 - .1 Record drawings
 - .2 Operations and maintenance manuals

- .3 A letter of acceptance from the local inspection authority. A copy is to be included in the operations and maintenance manuals.
- .4 A letter of guarantee. A copy is to be included in the operations and maintenance manuals.
- .5 Copies of the following test results (A copy is to be included in the operations and maintenance manuals):
 - .1 Insulation/megger tests
 - .2 Commissioning and/or Certification Report from the manufacturer for the following systems (A copy is to be included in the operations and maintenance manuals).
 - .3 Completed verification forms included with this section. When there are multiples of referenced equipment, devices or systems, electrical contractor is responsible for obtaining a suitable number of forms to complete the verification process for the entire project.

1.7 FUNCTIONAL PERFORMANCE TESTING (FPT)

- .1 Beyond ULC S1001 compliance the contractor is responsible for completing system specific onsite functional performance testing to CSA Z320 to ensure the following:
 - .1 All systems are complete and operational in all respects.
 - .2 All specified reports and documents have been submitted and approved.
 - .3 All tests, commissioning and start-up processes described elsewhere in the specification are complete.
 - .4 All demonstrations have been completed and documented.
 - .5 All defects and deficiencies identified during the commissioning of all electrical systems have been corrected.
 - .6 Provide documentation to be included in the O&M manual to demonstrate the functional status of each system at the time of the project's Substantial Completion.
- .2 FPT shall be performed on all electrical systems referenced in the contract documents, which may include, but not be limited to, the following:
 - .1 Power Distribution System
 - .2 Lighting and Lighting Control System
 - .3 Emergency and Exit Lighting System
 - .4 Structured Cabling and Communications Systems
 - .5 Access Control System
 - .6 Intrusion Detection

.7 CCTV Video Surveillance System

- .3 Deficiencies or discrepancies discovered during the FPT process are to be immediately rectified by the Electrical Contractor. A condition of Substantial Performance shall be the correction of all electrical deficiencies identified throughout the project associated with this work. The Electrical Contractor shall also provide exceptional arrangements for labor and materials required to correct deficiencies which prevent the satisfactory completion of the FPT process.
- .4 The contractor shall return copies of the deficiency lists to owner via the Engineer with all corrected items signed off.
- .5 The FPT Deficiency list will form part of the Substantial Performance Inspection list specified in Division 01.

1.8 FINAL REPORT

- .1 Assemble all testing data and verification reports and submit them to the Engineer.
- .2 Each form shall bear the signature of recorder, date of test, and all relevant information in clear and legible form.
- .3 Identify each instrument used, and latest date of calibration of each.
- .4 Include written confirmation by Owner's representatives that all verification, testing, instruction, and demonstrations have been completed to the Owner's satisfaction.

PART 2 PRODUCTS

2.1 N/A

PART 3 EXECUTION

3.1 INSULATION RESISTANCE TESTING

- .1 Megger circuits, feeders, and equipment up to 350V with a 500V instrument.
- .2 Check resistance to ground before terminating cables and wires.

3.2 VERIFICATION TESTS AND FORMS

- .1 Perform tests as required to properly complete the verification forms included in this section.
- .2 Deficiencies or discrepancies discovered during this process are to be immediately rectified by the Electrical Contractor. The Electrical Contractor shall provide exceptional arrangements for labor and materials as may be required to correct these deficiencies.

END OF SECTION

PART 1 **GENERAL**

1.1 **GENERAL**

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 **RELATED SECTIONS**

- .1 Section 26 05 28 - Grounding and Bonding.
- .2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .3 Section 28 23 00 - CCTV Video Surveillance System.

1.3 **REFERENCE STANDARDS**

- .1 CSA Group (CSA)
 - .1 CSA-C22.1-2018, Canadian Electrical Code.
 - .2 CSA-C22.2 No. 214-2017, Communications Cables (Bi-National standard with UL 444).
 - .3 CAN/CSA-C22.2 No. 226-92 (Reaffirmed 2006) - Protectors in Telecommunications Networks.
 - .4 CSA-C22.2 No. 232-2017, Optical Fiber Cables.
- .2 Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA)
 - .1 TIA-526-7 - Measurement of Optical Power Loss of Installed Singlemode Fibre Cable Plant.
 - .2 TIA-526-14-A - Optical Power Loss Measurements of Installed Multimode Fibre Cable Plant.
 - .3 ANSI/TIA/EIA-568-C.0, Generic Telecommunications Cabling for Customer Premises.
 - .4 TIA/EIA-568-C.1, Commercial Building Telecommunications Cabling Standard.
 - .5 ANSI/TIA/EIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard.

- .6 ANSI/TIA/EIA-568-C.3 Optical Fiber Cabling Components Standard.
- .7 ANSI/TIA/EIA-568-C.4 Broadband Coaxial Cabling and Components Standard.
- .8 ANSI/TIA-569-B - Commercial Building Standard for Telecommunications Pathways and Spaces.
- .9 ANSI/TIA-569-C - Optical Fibre Colour Coding.
- .10 TIA/EIA-606-C, Administration Standard for the Commercial Telecommunications Infrastructure.
- .11 ANSI/TIA-758-A - Customer-Owned Outside Plant Telecommunications Infrastructure Standard.
- .3 ANSI/BICSI Standards
 - .1 ANSI/BICSI 002-2014, Data Center Design and Implementation Best Practices.
 - .2 ANSI/BICSI 003-2014, Building Information Modeling (BIM) Practices for Information Technology Systems.
 - .3 ANSI/BICSI 004-2018, Information Communication Technology Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities.
 - .4 ANSI/BICSI 005-2016, Electronic Safety and Security (ESS) System Design and Implementation Best Practices.
 - .5 ANSI/BICSI 006-2015, Distributed Antenna System (DAS) Design and Implementation Best Practices.
 - .6 ANSI/BICSI 007-2017, Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises.
 - .7 ANSI/BICSI 008-2018, Wireless Local Area Network (WLAN) Systems Design and Implementation Best Practices.
 - .8 ANSI/BICSI N2-17, Practices for the Installation of Telecommunications and ICT Cabling Intended to Support Remote Power Applications.
 - .9 ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling.
 - .10 ANSI/NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings.
- .4 BICSI Standards
 - .1 BICSI Telecommunications Distribution Methods Manual (TDMM).

- .2 BICSI Information Transport Systems Installation Methods Manual (ITSIMM).
- .3 BICSI G1-17, ICT Outside Plant Construction and Installation: General Practices.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 26 05 01 - Electrical Submittals.
- .2 Shop drawings submission to include:
 - .1 Layout of equipment.
 - .2 Complete **PROJECT SPECIFIC** Wiring Diagrams and documentation.
 - .3 Provide PDF copy of an operational and maintenance manual for all products being supplied.
- .3 Submit close out documents in accordance with Section 26 05 02 - Electrical Contract Closeouts.
- .4 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual. Operation and maintenance data to include:
 - .1 Operation instructions.
 - .2 Description of system operation.
 - .3 Description of each subsystem operation.
 - .4 List showing each piece of equipment in system or subsystem by its original manufacturer name and model number.
 - .5 Part list showing parts used in equipment by identification numbers that are standard to electronics industry.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect public address systems from nicks, scratches, and blemishes.

- .3 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

1.7 SYSTEM DESCRIPTION

- .1 Structured telecommunications wiring system consist of unshielded-twisted-pair and optical fibre cables, terminations, connectors, cross-connection hardware and related equipment installed inside building for occupant's telecommunications systems, including voice (telephone), data, and image.
- .2 Installed in physical star configuration with separate horizontal and backbone sub-systems.
 - .1 Horizontal cables link work areas to telecommunications room located on same floor.
 - .2 Telecommunications rooms linked to main terminal/equipment room (MT/ER) by backbone cables.
 - .3 MT/ER also linked to Entrance Room by backbone cables.
- .3 Installations must comply with municipal, provincial, and federal regulations.
- .4 All work must be performed by a certified technical or licensed electrician where required.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURES

- .1 Belden IBDN with a 25-year warranty on parts and labour.
- .2 Panduit Pan-Net with a 25-year warranty on parts and labour.

- .3 Hubbell Premise Wiring with a 25-year warranty on parts and labour.

2.2 VOICE & DATA BACKBONE CABELING SYSTEM

- .1 Voice Backbone Cabling (UTP):
 - .1 Voice backbone cabling shall be Four-pair, 100 ohm balanced unshielded-twisted-pair (UTP) cable, flame test classification FT4 to: CSA-C22.2 No. 214, Enhanced Category 6 to: TIA/EIA-568-C.2.
 - .2 All backbone cables shall have 25% spare capacity.
 - .3 Cable to be terminated on, 48-port, 2U patch panel in data rack.
- .2 Data Backbone Cabling (UTP):
 - .1 Copper shall not be used for UTP backbone cabling between telecom room on this project.
 - .2 50µm OM4 6 strand fiber indoor distribution cable, 900µm buffered fibers:
 - .1 Riser cable.
 - .2 Plenum cable.
 - .3 All backbone cables shall have 25% spare capacity (minimum one cable).
- .3 Optical Fibre Patch Panel:
 - .1 1 RU Rack Mount Fiber Enclosure fitted with 6 position duplex LC fibre adapter panels.
- .4 The use of anything other than certified Category 6 cabling is strictly prohibited in municipal facilities unless approved in writing by Municipal IS staff.
- .5 Cables must be category 6, 100% copper colid-core, plenum rated (FT6) or riser-rated (FT4) as required by local building code.
- .6 Maximum cable length from patch panel to workstation must not exceed 90 meters (295 feet), with an additional 10 meters (33 feet) allowance for patch cords.
- .7 Cables must be installed in structed pathways (e.g. conduit, cable trays, or J-hooks) to minimize strain and interference.
- .8 Avoid running cables parallel to electrical wiring to reduce interference; maintain a minimum separation of 12 inches (30 cm) from power lines.

- .9 Cables should not be secured with zip ties that could damage insulation; use Velcro or other non-crushing fasteners.

2.3 HORIZONTAL DISTRIBUTION CABLE

- .1 Horizontal distribution UTP cabling shall provide outer cable jacket colours assigned for voice and data applications as listed:
 - .1 Voice cabling shall have BLUE outer jacket.
 - .2 Data cabling shall have WHITE or GREY outer jacket.
 - .3 Special application cabling (i.e. CCTV) shall have YELLOW outer jacket.
- .2 Horizontal Distribution Cable:
 - .1 Shall be 100 ohm, Four-pair underlying metallic shield, Category 6 with to: TIA/EIA-568, flame test classification FT4 to: CSA-C22.2 No. 214.
 - .2 Transmission Characteristic 1 TO 500MHz.
 - .3 Cable to be provided in the following colours:
 - .1 Blue, 6, FT4.
 - .2 White, 6, FT4.
 - .3 Yellow, 6, FT4.
 - .4 Brown, 6, FT4

2.4 SERVICE PROVIDER ENTRANCE FACILITIES

- .1 Building Telecommunications Demarcation:
 - .1 The building information transport system demarcation facilities shall include three basic components:
 - .1 Building cross-connect hardware.
- .2 Demarcation backbone cable:
 - .1 Building demarcation termination hardware.
 - .2 Demarcation connectors shall be RJ21X female for the service provider and RJ21X male for the building.

2.5 TERMINATION BLOCKS

- .1 Eight-position modular jack "RJ-45", type Category 6 to: TIA/EIA-568- C.2:
 - .1 In self-contained surface-mount box.
- .2 Multi-user telecommunications outlet assembly (MUTOA) installed "RJ-45" jacks, type field to: TIA/EIA-568 Category 6.

2.6 PATCH PANELS

- .1 24 port (1U)/48 port (2U) 8 position modular patch panels.
- .2 E1A-310-D 482 mm (19") Mount Compliant.
- .3 Wiring Configuration T568A (ISDN).
- .4 Each port equipped with field installed "RJ-45" jacks, type Category 6 to: TIA/EIA-568-C.2.
- .5 Horizontal cable-management unit for every 48 ports.

2.7 PATCH CORDS AND JUMPER CABLES

- .1 Patch cords must be the same manufacturer type as the warranty solution being provided.
- .2 24 AWG Stranded Wire, 8MO-8MOD and with factory-installed male plug at other end to mate with "RJ-45" jack to: TIA/EIA-568-Category 6, 4 pairs.
- .3 Structured Media Enclosure:
 - .1 Provide quantity of patch cords to meet immediate requirement plus 20%.
- .4 Work Area:
 - .1 3m (10 foot) in length.
 - .2 Provide quantity of patch cords to meet immediate requirement plus 20%.

2.8 RACK AND CABLE MANAGEMENT

- .1 Rack:
 - .1 Self-squaring, self-leveling, 11-gauge steel, black powder coat relay rack, C/W mounting hardware and screws.
 - .2 Forty-five (45) U minimum mounting spaces (rack units).
- .2 Rack Mounted UPS:
 - .1 Line Interactive, 3kVA, Rack/tower convertible 2U, 120V.
 - .2 Rated power of 2880 VA.
 - .3 Input power via a single L5-30R NEMA cord.
 - .4 Maximum 15A output current connection (3) 5-15R+3, (3) 5-20R and (1) L5-30R.

- .5 Less than 5% THD.
- .6 Transfer time: 2-4 ms 4ms typical: 8ms maximum.
- .7 Output frequency: 50/60 Hz +/- 3 Hz sync to mains.
- .8 738 VAh runtime lead acid battery.
- .9 Surge protection at 540J and filtering: Full time multi-pole noise filtering: 0.3% IEEE surge let-through: zero clamping response time: m.
- .3 Rack Mount Power Distribution:
 - .1 Rackmount Power, 9 Outlet, 15A, Basic Surge to be complete with Eight 5-15R rear outlets.
 - .2 One 5-15R front outlet.
 - .3 15-amp circuit breaker.
 - .4 Differential and common mode surge & spike protection.
 - .5 EMI filtering.
 - .6 6 M (20 foot) power cord.

PART 3 **EXECUTION**

3.1 **INSTALLATION**

- .1 Entrance Cables:
 - .1 Outside plant (OSP) cables shall be exposed within the premise for a maximum of 3 m from the building entrance.
 - .2 OSP entrance cables may only extend beyond 3 meters provided they are enclosed in rigid conduit.
- .2 Telecommunications Room (TR):
 - .1 Connectors shall be colour coded as follows:
 - .1 White for copper data backbone cabling.
 - .2 Purple for incoming voice backbone cabling.
 - .3 Grey for data horizontal cabling.
 - .4 Blue for voice horizontal cabling.
 - .5 Yellow for special applications (POE, CCTV, etc.) horizontal cabling.
 - .2 Populate unused / spare ports in all patch panels with modular connectors colour coded to match the active ports in the patch panel.
- .3 Horizontal Cabling:

- .1 All horizontal cables shall be terminated on modular eight-position connectors with T568A pin/pair assignments using insulation displacement connectors (IDC).
- .2 Horizontal distribution UTP cabling shall provide outer cable jacket colours assigned for voice and data applications as listed:

System Description	Jacket Colour
Voice	Blue
Data	White
Intrusion Detection	Red
Access Control	Brown
Building control (BAS)	Yellow
CCTV	Grey

- .3 The maximum horizontal distance in cable length from the horizontal termination equipment connections in the Telecommunications Room (TR) space to the work area Telecommunications Outlet (TO) is 90 meters (295 feet). For each horizontal channel, a total of 10 meters (33 feet) is permitted for patch cords or jumpers and for equipment cables or cords located in the work area and TR space respectively. The total channel link (horizontal cabling and cords) shall not exceed 100 meters (328 feet).
- .4 Work Areas - Telecommunications Outlet Box:
 - .1 Each telecommunications outlet box shall be a minimum 102mm (4") sq, minimum 73mm (2 7/8") deep with a manufactured conduit knockout to accommodate a 27mm (1") conduit. The outlet is to be complete with a double gang square welded tile ring one nominal size larger than the installed wall board thickness and a 4 port, keystone style, brushed stainless steel coverplate. Coverplates with recessed inserts for labeling or identification purposes are not acceptable. Receptacle coverplates with 106 adaptors are not acceptable for flush mounted telecommunications outlets installed below ceilings. Where telecommunication outlet boxes are required to be surface mounted, provide a single gang deep "FS" type box (minimum volume 22.5 cubic inches (368 ml)) complete with "FS" type coverplate and 106 adaptor.
 - .2 Each telecommunications outlet box shall have an EMT conduit, minimum 27 mm (1"), stubbed up with a 90 degree or offset bend into the accessible ceiling space of the same room and terminated with a bushing.

- .3 Each telecommunications outlet box shall be installed within 1000 mm (39") of an electrical outlet and installed at the same height and have a matching coverplate.
- .4 Work area telecommunications outlets with unique applications shall be addressed appropriately to conform to industry standards and practices (e.g. system furniture bezels, weatherproof outlets and keystone adaptors).
- .5 Provide a 3m (10') equipment patch cord for each installed data outlet plus 25% of the total number as spare equipment patch cords.
- .5 Work Areas - Telecommunications Outlet Connector:
 - .1 Each work area shall be served by a minimum of two Category 6 cables terminated on modular eight-position connectors with T568A pin/pair assignments using insulation displacement connectors (IDC). Outlet connectors shall meet component specifications per ANSI/TIA-568-C.2.
 - .2 Work area telecommunications outlets shall have a minimum 4 port modular jack capacity, be mounted in a single gang brushed stainless steel coverplate. Sufficient cable slack (minimum 200mm) shall be provided and coiled within the back box to allow the removal of the cover plate and access the outlet box.
 - .3 Telecommunications outlet connectors shall meet component specifications per ANSI/TIA-568-C.2 and shall be colour coded as follows:
 - .1 Grey for data or Local Area Network (LAN) connections.
 - .2 Blue for voice or other telephony connections.
 - .3 Yellow for special applications.
- .6 Work Areas - Telecommunications Outlet Connector, Located Above Ceiling:
 - .1 Outlet Connectors provided above ceilings shall be served by a minimum of two Category 6 cables terminated on modular eight-position connectors with T568A pin/pair assignments using insulation displacement connectors (IDC). Outlet connectors shall meet component specifications per ANSI/TIA-568-C.2.
 - .2 The above ceiling telecommunications outlet shall be a 100mm (4") square x 73mm (2 7/8") deep box with 10mm (3/8") raised quad receptacle coverplate complete with 2 port 106 keystone adaptors, provide blanks as required the outlet shall be mounted vertically on support structure.

- .3 Telecommunications outlet connectors shall meet component specifications per ANSI/TIA-568-C.2 and shall be colour coded as follows:
 - .1 Grey for data or Local Area Network (LAN) connections.
 - .2 Blue for voice or other telephony connections.
 - .3 Yellow for special applications (POE, CCTV, etc.).
- .4 Where communication cables are permitted to be installed in a ceiling space without the benefit of conduit, main runs shall be installed in an aluminum ladder tray, sized to carry applicable plus 25% spare.

3.2 GROUNDING AND BONDING

- .1 See Section 26 05 28 - Grounding and Bonding for further details.
- .2 All conduit for all electrical (including communications) systems is to contain a minimum # 12 AWG copper bond wire. Bonding jumpers are permitted for conduit stubbed into a T-bar ceiling. All metallic conduit stubs shall be bonded regardless of length.
- .3 All other various systems' electrical ground connections (excluding data rack grounds) are to take place on the ground bus with "compression" type lugs. Lugs are to be as follows:
 - .1 Copper, one-hole, short barrel (single crimp) type lugs are to be used for all wire sizes up to, but not including #6 AWG.
 - .2 Copper, two holes, long barrel (dual crimp) type lugs are to be used for all wire sizes #6 AWG and larger.
 - .3 To be bolted to bus bar utilizing concave, or combination of flat and locking type washers c/w accompanying hardware as may be required.
- .4 Provide an information transport system bonding riser on the drawings.
- .5 Provide and install an information transport system bonding system to meet or exceed the requirements identified in the latest edition of the TIA 607 standard for Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
- .6 Provide and install one predrilled minimum size 6mm x 100mm x 600mm (1/4" x 4" x 24") Primary Bonding Busbar (PBB) copper bonding bus bar in the main Telecommunications Entrance Facility, either vertically or horizontally wall mounted 450mm (18") A.F.F. c/w approved cone shaped insulators for securing bus directly to wall.

- .7 Provide and install one predrilled minimum size 6mm x 100mm x 600mm (1/4" x 4" x 24") Secondary Bonding Busbar (SBB) copper bonding bus bar in each telecommunications room, either vertically or horizontally wall mounted 450mm (18") A.F.F. c/w approved cone shaped insulators for securing bus directly to wall.
- .8 Bond each copper bonding bus bar to the building metallic structural framing where available.
- .9 In each telecommunications room, bond all conductive equipment enclosures (including power panels) to the copper bonding bus bar.
- .10 Bond each equipment rack individually to the room's copper bonding bus bar.
- .11 The minimum size information transport systems bonding conductor shall be #6 AWG.
- .12 All Telecommunications Bonding Backbone (TBB) and Telecommunications Bonding Conductor (TBC) conductors shall be sized in accordance with the latest TIA 607 standard for Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises recommendations.
- .13 All Information transport systems bonding conductors are to be complete with green coloured insulation, the use of bare, stranded bonding conductors in cable tray is not permitted.
- .14 Information transport systems bonding conductors are to be run as directly as possible following building lines; minimizing the number of bends in the conductor and secured to meet the latest edition CEC requirements. The minimum bend radius of any information transport systems bonding conductor not run-in conduit shall be 230mm (9").
- .15 All bonding conductors exiting the telecommunications room, with the sole exception of the conductor used to bond the cable trays, shall be run in conduit. Ensure these conduits are bonded at both ends.
- .16 All conductor-to-conductor connections to the Telecommunications Bonding Backbone (TBB) and all other bonding conductors are to be made using irreversible, listed, compression connection; or by using an exothermic welded connection.
- .17 Bonding / Grounding Conductor Identification:

- .1 All bonding / grounding conductors shall be identified at both ends to indicate the bonded equipment (bond bar end) and the originating bond bus (equipment end of the bond conductor) using size one Lamicoid nameplates secured to the conductor with two metal straps.
- .18 Ensure ALL antennae cables are routed through properly bonded RF protection device(s) at the antenna cable entry point to the building for lightning protection.

3.3 LABELLING AND ADMINISTRATION

- .1 The requirements for system administration are Class 2 specified within the ANSI/EIA/TIA-606 standard which provides for the Information Transport System (ITS) infrastructure administration needs within a single building.
- .2 A unique identifier is to be associated with each element of the ITS infrastructure to be administered.
- .3 All components of the ITS administration system shall be designed and installed to last the intended life (20-year warranty period) of the ITS system installed.
- .4 The coloured components shall include horizontal cables, patch cords and modular jacks. (In some applications coloured jack bezels may be used. Confirm application with Province).
- .5 Labeling to be provided based on Nova Scotia Government Structured Cabling Guidelines Information Transport Systems.
- .6 Final connections to any municipal equipment shall only be performed by Municipal IS staff.
- .7 All cables must be terminated at patch panels (rack-mounted) in communication rooms and keystone jacks (RJ45) at workstation outlets.
- .8 T568B wiring standard must be used for all terminations.
- .9 Patch panels and wall plates must be clearly labeled using a structured numbering scheme, following any existing scheme the Municipality has in place.
- .10 Each cable must have a durable, machine-printed, wrap-around label at both ends, specifying location and connection details.

3.4 TESTING AND CERTIFICATION

- .1 Certification and testing documentation shall be provided as a complete part of the project documentation requirements as specified in Section 6 of this document. Documentation shall include a RCDD letter of certification (complete with current RCDD seal) for the complete Information Transport System cabling for the project.
- .2 All cabling must be tested. Testing must include:
 - .1 Wiremap verification
 - .2 Length measurement
 - .3 Attenuation (signal loss) testing
 - .4 Near-end Crosstalk (NEXT) and Power Sum NEXT testing
 - .5 Return loss and ACR-F measurements
- .3 Test results must be documented and submitted for review before final acceptance.
- .4 Cables that fail testing must be replaced or re-terminated and re-tested.

3.5 FIELD QUALITY CONTROL

- .1 Include a copy of the communications cabling installation permit and all inspection reports from the AHJ with the documentation. Where an exemption from the requirement for a communications cabling installation permit is provided under the "Electrical Code Regulations - Electrical Installation and Inspection Act (Nova Scotia)"; include a copy of the record of the work completed by the communications cabling specialist required under this act.
- .2 Vendors shall provide test results hard (paper) copy and in digital format on CDROM and USB stick as part of compliance with this requirement. The test report(s) is to include plot (graphical) data of each test performed.

3.6 RCDD PROJECT MANAGER REQUIREMENT

- .1 The successful Information Transport Distribution System contractor is required to retain the services of one (1) Registered Communications Distribution Designer (RCDD) for the duration of the project. The RCDD must be identified and the successful vendor must provide a copy of the RCDD current certificate and BICSI membership on a timely basis after award of the contract.
- .2 The RCDD shall maintain responsibility for the following:

- .1 Review and accept the Information Transport Distribution System materials, hardware and related components proposed.
- .2 Review the proposed pathways and spaces and accept the size and location of all Telecommunications Spaces (TS).
- .3 Notify the Consultant of any issues or concerns related to CAN/CSA, IEE and TIE/EIA specification compliance.
- .4 Review and approve Information Transport Distribution System material shop drawings prior to submission to the Consultant.
- .5 Attend regularly scheduled project construction and job meetings as requested by the project Consultant.
- .6 Ensure system installation practices and procedures comply with all applicable CAN/CSA, IEE and TIE/EIA specifications and procedures.
- .7 Provide regular project status reports and updates as requested by the project Consultant.
- .8 Observe testing and certification procedures and provide manufacturers assurance and warranty.
- .9 Review and approve all project as-built documentation including drawings, test reports, details and provide current RCDD seal on all.

3.7 PROJECT DOCUMENTATION

- .1 Record drawings shall provide the following information:
 - .1 All work area telecommunications outlet locations as constructed.
 - .2 Project administration system identifiers for telecommunications outlets.
 - .3 Project administration system identifiers for telecommunication spaces (TR and ER).
 - .4 Hard copy format record drawings shall be provided in two complete sets as defined:
 - .1 One complete floor plan and riser drawing set, black and white (colour optional).
 - .2 One complete floor plan drawing set, black and white (colour optional), is to be provided and mounted under plexiglass in all associated telecommunications spaces.
 - .3 One complete backbone riser drawing set, black and white (colour optional), is to be provided and mounted under plexiglass in the main telecommunications room.

- .4 One complete grounding / bonding riser drawing set, black and white (colour optional), is to be provided and mounted under plexiglass in the main telecommunications room).
- .5 Where hard copy record drawings exist on-site in renovations and small additions where the majority of the structured cabling system is not modified or is being reused, update these documents to reflect the installed alterations.
- .5 Include in the as-built documentation a tabulated matrix in both hard copy and editable electronic format (e.g. Excel) listing the location of the telecommunications outlet by the rack component outlet identifier. The information provided shall include Telecommunication Room number, rack/cabinet number, and patch panel number.
Example:

TELECOMM ROOM	RACK #	RACK OUTLET ID	OUTLET LOCATION
TR-118	R-1	D-024	RM 124
TR-118	R-2	D-024	CORR 101 – RM 115
TR-118	R-3	D-024	RM 123

- .1 Contractors must provide as-built diagrams showing cable routes, termination points, and communication room layouts.
- .2 A full cable testing results report must be provided for each installation, including Municipal IS staff approval.
- .3 Installations must be inspected and approved by the Municipal IS Division before final sign-off.

3.8 CUSTOMER/OWNER ORIENTATION AND TRAINING

- .1 Provide an initial five (5) hours of training to the owner's representative.
- .2 Visit site 30 days following substantial performance and provide an additional eight (8) hours of training. Visit site 60 days following substantial performance and provide an additional four (4) hours of training.

3.9 WARRANTY

- .1 Vendors shall provide a manufacturer generated and support Product Warranty and Application Assurance certificates upon completion of installation and acceptance by Owner.
- .2 Manufacturer's Warranty is in addition to and not a limitation of other rights Departmental Representative, DCC Representative or Consultant may have under the Contract Conditions.
- .3 Product warranty and appliance assurance shall provide coverage of materials and labour for a minimum of Twenty Years from date of installation and acceptance regardless of installing agent/vendor status.

3.10 ADDITIONAL CONSIDERATIONS

- .1 Access to communication rooms must be granted by Municipal IS staff.
- .2 Communication rooms must be climate-controlled and secure.
- .3 Communications cabinets not in communication rooms must be locked at all times. Access can be granted by Municipal IS staff.
- .4 Patch cords used in racks must be factory-made, Ethernet-rated and properly managed.
- .5 Any cable penetrations through fire-rated walls must be sealed with fire-stop putty or caulking compliant with fire codes. Refer to spec section 26 05 04 Through Penetration and Firestopping of Electrical.

3.11 COMMISSIONING

- .1 Carry out the commissioning in conformance with Section 26 91 13 - Testing and Verification.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 0 and Division 1, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED SECTIONS

- .1 Related Sections:
 - .1 08 71 10 Door Hardware.
 - .2 26 05 31 Splitter, Junction, Pull Boxes and Cabinets.
 - .3 26 05 32 Outlet Boxes, Conduit Boxes and Fittings.
 - .4 26 05 34 Conduits, Conduits Fastenings and Conduit Fittings.
 - .5 28 13 25 Door Hardware Wiring.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 26 05 01 - Electrical Submittals.
- .2 Complete **PROJECT SPECIFIC** Wiring Diagrams.
- .3 Provide PDF copy of an operational and maintenance manual for all products being supplied.

- .1 Submit close out documents in accordance with Section 26 05 02 - Electrical Contract Closeouts.
- .2 Operation and Maintenance Data: submit operation and maintenance data for public address for incorporation into manual. Include in manual.
 - .1 Operation instructions.
 - .2 Description of system operation.
 - .3 Description of each subsystem operation.
 - .4 List showing each piece of equipment in system or subsystem by its original manufacturer name and model number.
 - .5 Part list showing parts used in equipment by identification numbers that are standard to electronics industry.

1.5 DESCRIPTION OF SYSTEM

- .1 The Access Control System (ACS) to consist of components, hardware, controls, software, firmware, wire and conduits for a complete operating system to provide monitoring and control of access points.
- .2 The battery backup for controllers and strikes (or other electrically operating door locking hardware) shall be sized for a minimum of eight (8) hours of operation.
- .3 Monitored points will be supervised for such conditions as alarm, short circuit, ground, open and normal conditions.
- .4 System to include the following:
 - .1 Reader Access control panels.
 - .2 Proximity card readers.
 - .3 Proximity cards.
 - .4 Security management software.
 - .5 Power supplies where indicated by Division 8.
 - .6 Power Supplies.
 - .7 Door monitor switches.
 - .8 Electrically operated door locking hardware (Supplied by Division 8).
 - .9 Request to Exit Devices.
 - .10 Electric strikes (Supplied by Division 8).
 - .11 System Integration Points (SIP) (Supplied by Division 8).

- .12 Wiring and conduit for a complete operating system.
 - .13 Batteries.
 - .14 Door Contacts
- .5 This contractor shall configure and program the access control system to function as per this specification's requirements. It is the contractor's responsibility to deliver a fully functioning access control system.

PART 2 PRODUCTS

2.1 INTELLIGENT ACCESS CONTROL PANEL

- .1 Two (2)/ Eight (8) readers per controller capability.
- .2 True 32-bit microprocessor.
- .3 Flash memory.
- .4 Support for TCP/IP protocols.
- .5 45,000 cardholder capacity.
- .6 Unlimited access codes.
- .7 Real time clock.
- .8 RS232/RS485/Ethernet communications support.
- .9 Anti-passback support.
- .10 120 VAC input, 16.5 VAC output wall transformer.
- .11 Battery backup.
- .12 Metal cabinet with lock.
- .13 Multiple controllers mounted in central access control panel as indicated.

2.2 DOOR MONITOR SWITCH

- .1 Door contacts: vandal resistant, tamper proof, suitable for flush mounting on door.
- .2 Rare earth magnet.
- .3 Single pole, double throw.
- .4 Hermetically sealed magnetic reed switch.

2.3 REQUEST TO EXIT DEVICES

- .1 Passive infrared detector.
- .2 DSP filter technology.
- .3 Min relay contacts rated @ 1A, SPDT.

2.4 PROXIMITY CARD READERS

- .1 Two gang electrical box with plaster ring for mounting.
- .2 Operating Range: -31 to +150 degrees C.
- .3 LED indicators and Piezo buzzer.
- .4 Output Format: Wiegand.
- .5 Up to 38mm physical credentials read range, up to 4.6m mobile credentials read range.
- .6 Weatherproof design.

2.5 PROXIMITY CARDS

- .1 Passive proximity technology.
- .2 Wiegand format.

2.6 ACCESS CONTROL AND SECURITY MANAGEMENT SOFTWARE

- .1 Keyscan Aurora access control system software.

2.7 POWER SUPPLY

- .1 Power auxiliary supply unit with the following features:
 - .1 ULC Power supply unit.
 - .2 120 VAC input, 12 VDC output.
 - .3 2.5 amp supply current.
 - .4 Battery backup using two (2) 12 VDC/12 AH batteries.
 - .5 AC fail and low battery supervision (Form C contacts).
 - .6 16.5-volt, 40 VA transformer.
 - .7 NEMA Type 1 enclosure.

2.8 STANDARD OF ACCEPTANCE

- .1 Access control system components as follows:

Part Number:	Access Control Description:
CA200	2-reader Door Access Controller (DC-2)
CA8500	8-reader Door Access Controller (DC-1)
Keyscan Aurora 1.0.24.0	Access Control Software
Supplied by Division 8 (RCI series)	Electric Strike
Supplied by Division 8	Door Interface Relay
Supplied by Division 8 (DKPS series)	2/4/6 amp Power Supply, 2-24 VDC
Supplied by Division 8 (RCI series)	Maglock
E-Plex 5700	Electronic Lock c/w PIN code & card reader entry
TRI-BAT127	12V 12AH Seal Lead Battery
RCI 9540	Recessed Magnetic Contact/Door Position Switch
RCI PSC-1-H	125 kHz Card Reader
Completed by owner	Alarm Monitoring

PART 3 **EXECUTION**

3.1 **INSTALLATION**

- .1 Supply and install an access control system with all required components and wiring and licenses for a complete and fully functional Keyscan Aurora system. The equipment manufacturer's certified representative will supply all the equipment and devices, and make all the connections.
- .2 Verify wire type and gauge with manufacturer prior to installation. All access control system wiring is to incorporate a "Brown" coloured jacket and be installed in a conduit system.
- .3 Install all Access Control system wiring in a conduit system, with the exception of wiring within existing wall partitions down to door frames. Terminate conduit in a junction box above ceiling adjacent existing wall. Wiring to be installed in a "free air" fashion in wall cavity.
- .4 Locate all components as indicated on drawings.
- .5 Wire and connect to electrically operated door hardware supplied by Division 8. Confirm location of each device requiring a backbox or pathway prior to installation.
- .6 Install, wire and connect to request to exit (REX) devices. Confirm location of each device requiring a backbox or pathway prior to installation.
- .7 Install Intelligent Control Modules where indicated.
- .8 Install power supplies where indicated.
- .9 Install card readers where indicated.
- .10 Install door position switches. Confirm location of each device requiring a backbox or pathway prior to installation.
- .11 Connect the system to the building network as indicated.
- .12 Make connection to the network for remote access.
- .13 Provide all documentation associated with the access control system alarm panel to the Owner, **including all programming/contractor codes required for future modifications to the system.**

- .14 This contractor shall configure and program the access control system to function as per the requirements of this specification.
- .15 Access Control System to be programmed and fully commissioned by a factory trained representative or authorized dealer.
- .16 Dealer must have at least two technicians with certification in Dormakaba Keyscan Aurora access control software.
- .17 Connect and install all equipment supplied by Division 8 to provide a complete, functioning door access control system.
- .18 All technicians working on the access control system shall have all the required training and certifications required by the equipment manufacturer. Non-certified technicians are prohibited from completing any part of the installation.

3.2 PROGRAMMING AND TRAINING

- .1 Provide the initial programming, customizing, and data entry.
- .2 Provide Demonstration, Operating and Maintenance Instructions as per Section 26 05 02 - Electrical Contract Closeouts.
- .3 Provide an initial five (5) hours of training to the Owner's designated representative.
- .4 Visit site 30 days following substantial performance and provide an additional eight (8) hours of training. Visit site 60 days following substantial performance and provide an additional four (4) hours of training.

3.3 COMMISSIONING

- .1 Carry out the commissioning in accordance with Section 26 91 13 - Testing and Verification.
- .2 A written report shall be prepared detailing the access control system verification and submitted to the Engineer.

END OF SECTION

The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 00 and Division 01, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

PART 1 **GENERAL**

1.1 **RELATED REQUIREMENTS**

- .1 Section 08 71 00 – Door Hardware.
- .2 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

1.2 **REFERENCE STANDARDS**

- .1 CSA
 - .1 CSA C22.1 latest edition

1.3 **ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 26 05 01 - Electrical Submittals.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware systems and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings:
 - .1 Riser diagram, block diagram of complete Life Safety Systems integration.
 - .2 Door hardware system design criteria.

1.4 **CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 26 05 02 - Electrical Closeouts.
- .2 Operation and Maintenance Data: submit operation and maintenance data for public address for incorporation into manual.
- .3 Include in manual:

- .1 Operation instructions.
- .2 Description of system operation.
- .3 Description of each subsystem operation.
- .4 List showing each piece of equipment in system or subsystem by its original manufacturer name and model number.
- .5 Part list showing parts used in equipment by identification numbers that are standard to electronics industry.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit maintenance materials in accordance with Section 26 05 02 Electrical Closeouts.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 EQUIPMENT SUPPLIED UNDER THIS SECTION

- .1 Provide all 120 VAC wiring in conduit system for power supply as indicated.
- .2 Provide conduit system with pull cords for installation of 24VDC wiring by door hardware supplier, as indicated.
- .3 Door wiring shall be completed as per door hardware shop drawings provided by div. 8.
- .4 Door hardware integration to electrical auxiliary systems including but may not be limited to fire alarm, power, communications, and access control.

2.2 EQUIPMENT SUPPLIED BY DIVISION 08

- .1 Electrical contractor to coordinate with section Div 08 products and supplied shop drawings to complete the door hardware wiring.

PART 3 EXECUTION

3.1 EXECUTION

- .1 This section covers the provision of power for door locks and conduit for 24 VDC hardware wiring.
- .2 Door lock equipment and card access equipment provided by the door hardware supplier.
- .3 Low voltage (24VDC) wiring supplied & installed by the door hardware supplier.
- .4 Install 120 VAC power to door power supplies.
- .5 Install empty conduit system c/w pull cords for 24 VDC wiring.

3.2 COORDINATION

- .1 Co-ordinate with door hardware supplier to ensure that equipment, boxes, wiring and conduit are located correctly.

3.3 CONNECTION TO FIRE ALARM PANEL

- .1 Where scheduled, door power supplies shall be wired to normally closed contacts in the fire alarm panel to release door locks on activation of fire alarm.

3.4 CERTIFICATE OF COMPLIANCE

- .1 Provide a letter of verification stating that the system has been checked out and is operational in advance of the Substantial Completion inspection.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 0 and Division 1, Section 26 05 00 - Common Work Results for Electrical, Section 26 05 01 - Electrical Submittals and Section 26 05 02 - Electrical Contract Closeouts, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED SECTIONS

- .1 Section 26 05 34 - Conduits, Conduit Fastenings and Fittings
- .2 Section 27 10 05 – Structured Cabling for Communications Systems

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22 Part 1 and Part 2 2024 edition.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 26 05 01- Electrical Submittals.
- .2 Submit close out documents in accordance with Section 26 05 02 - Electrical Closeouts.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:

- .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect public address systems from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

1.6 DESCRIPTION OF SYSTEM

- .1 The work covered by this section includes the supply and install of roughin components for and mounting of owner supplied CCTV equipment for a video surveillance system and communications network to conduct video surveillance for the premises.
- .2 The video surveillance system shall be an IP based, integrated system including, High Definition IP cameras, patch panels, Power Over Ethernet (POE) switches, copper patch cords, interior and exterior dome enclosures, power supplies, site licenses, cable and connectors, wire and conduits, programming, training and commissioning as further specified.
- .3 The work shall include all materials not specifically mentioned, but which may be deemed necessary to complete any portion of the work in compliance with the requirements of these specifications.
- .1 All work is to be carried out in accordance with CAS C22.1-24 and the minimum standards of these tender documents.

PART 2 PRODUCTS

2.1 CAMERAS

- .1 Cameras are to be pre-purchased by owner; exact specifications may vary from below.
 - .1 Camera – Type A Interior
 - .1 Axis cat# P3265-LV.
 - .2 Camera to be mounted on recessed or suspended octagon box as required for the location being installed.
 - .3 Interior Dome Camera Support System.
 - .1 Adjustable Back Box Support.
 - .4 Acoustical Tee Adjustable Box Hanger to meet the following requirements:
 - .1 Supports octagonal or square boxes on 24" span.

- .2 Bendable ends.
- .3 Accommodates heights from 1 ½" to 8 ¾".
- .4 Galvanized finish
- .5 35 Lbs Static Load Capacity with dedicated drop-wire
- .6 B-Line BA05A or equivalent
- .5 Acoustical Tee box hanger to meet the following requirements:
 - .1 Supports octagonal or square boxes on 24" span with dual support brackets.
 - .2 Bendable ends.
 - .3 Galvanized finish
 - .4 35 Lbs Static Load Capacity with dedicated drop-wire
 - .5 B-Line BA50F or equivalent.
- .2 Camera – Type B Exterior
 - .1 Axis Cat# P3267-LVE and wall mounting hardware.
 - .2 Camera to be mounted on owner supplied wall or pendent hardware mounting box with arm as required for the location the camera is being installed.

2.2 VIDEO SURVEILLANCE HORIZONTAL CABLING SYSTEM

- .1 Cable
 - .1 23 AWG 4 pair Category 6A cable.
 - .2 CMR (FT4 Rated).
 - .3 Yellow Outer Jacket.
 - .4 Category 6 Compliant to 568-C.2.
 - .5 Belden IBDN 10GX series.
- .2 Patch Panels
 - .1 24 port (2U) 8 position mod patch panels.
 - .2 EIA-310-D 482 mm (19") Mount Compliant.
 - .3 Wiring Configuration T568A (ISDN).
 - .4 Belden IBDN 10GX series.
 - .5 Category 6A Compliant.

2.3 VIDEO SURVEILLANCE PATCHCORDS

- .1 Patch cords shall be supplied and installed between the patch panel and NVR by the owner's rep.

2.4 POWER OVER ETHERNET (POE) SWITCHES

- .1 Supplied and installed by owner's rep.

2.5 VIDEO SURVEILLANCE DIGITAL VIDEO RECORDER

- .1 Supplied, installed, programmed and commissioned by owner's rep.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

- .1 Ensure that every system component is installed according to manufacturer recommendations, and specifications.
- .2 Install patch panel and switch in existing building section data rack.
- .3 Install equipment rack where indicated and secure to floor or wall.
- .4 Install patch panels in equipment rack and populate with modules. Provide blanks for unused ports.
- .5 Provide a slack loop of three (3) meters within each telecommunication room for all installed cables. The purpose of this service loop is to allow any future re-configuration and/or upgrade of these telecommunications rooms.
- .6 Provide a (1) meter slack loop above each camera in the accessible ceiling space. The slack loop is to be stored in a "Figure 8" configuration with each loop of the figure 8 (minimum diameter 200 mm [8 inch]) supported on separate J-hooks.
- .7 Install multiple camera power supply and connect to power.
- .8 Install domed interior video cameras where indicated.
- .9 Provide additional support to ensure camera dome cannot be modified or rotated using specified support brackets.
- .10 Secure all support brackets to "tees" using self-tapping screws.

- .11 Provide additional support for the domed cameras with a dedicated drop-wire attached to the support bracket and the building structure.
- .12 Install exterior video cameras, install domes, mounts and adapters.
- .13 Install patch panels in racks where indicated.
- .14 Permanently identify video surveillance horizontal cabling at each end. The identification must be identical and indicate the originating Telecommunications Rooms (TR) and the consecutively numbered jack. This same information is to appear on the patch panel and outlet jack location.
- .15 Provide rough-in for power and signal in locations where indicated for connection by Owner.

3.2 WIRING

- .1 As per the Canadian Electrical Code.
 - .1 All wiring must be FT-6 rated, insulated copper conductors, Category 6A between cameras and patch panels.
 - .2 All video surveillance wiring is to be installed in a conduit system with a dedicated #12 AWG green ground where not concealed.
 - .3 Use rigid PVC or liquid tight flexible metal conduit for all exterior wiring, where not concealed.

3.3 AIMING

- .1 Cameras are to be aimed as indicated. The final aim of each camera shall be agreed to in writing by the owner prior to final completion.

3.4 FIELD QUALITY CONTROL

- .1 Verify the operation of all devices.
- .2 Verify the wiring to all equipment is complete.
- .3 Provide a copy of inspecting technician's report to the owner. Identify each device by location and certify the test results.
- .4 At the end of installation, make all necessary tests in the presence of the user's representative. Perform a Category 6A permanent link test of each installed cable to 500 MHz performance parameters. Submit test results

for review. All cables tested must meet or exceed the minimum transmission requirements as per Category 6A requirements.

3.5 COMMISSIONING

- .1 Contractor shall arrange a time with owner's representative to complete onsite testing and commission the equipment.

END OF SECTION