

DIVISION 26	ELECTERICAL
SECTION 26 05 00	FORM OF SUPPLEMENTARY ELECTRICAL TENDER
SECTION 26 05 01	ELECTRICAL WORK GENERAL INSTRUCTIONS
SECTION 26 05 21	WIRES AND CABLES
SECTION 26 05 28	GROUNDING
SECTION 26 05 31	SPLITTERS, JUNCTION, PULL BOXES AND CABINETS
SECTION 26 05 32	OUTLET BOXES, CONDUIT BOXES AND FITTINGS
SECTION 26 05 34	CONDUITS, CONDUIT FASTENINGS AND CONDUIT FITTINGS
SECTION 26 08 10	ACCESS PANELS
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SECTION 26 08 30	PIPE TRACING SYSTEM
SECTION 26 08 40	BUILDING AUTOMATION SYSTEM
SECTION 26 12 17	DRY TYPE TRANSFORMER
SECTION 26 24 16	PANEL BOARDS
SECTION 26 24 17	POWER PANELS
SECTION 26 27 26	WIRING DEVICES
SECTION 26 28 13	FUSES
SECTION 26 28 23	DISCONNECT SWITCHES-FUSED AND NON-FUSED
SECTION 26 29 01	CONTACTORS
SECTION 26 29 10	MOTOR STARTERS
SECTION 26 50 00	LIGHTING
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DIVISION 27	COMMUNICATIONS
SECTION 27 11 19	STRUCTURED CABLING FOR COMMUNICATIONS SYSTEMS
SECTION 27 51 16	PUBLIC ADDRESS SYSTEM
DIVISION 28	ELECTRONIC SAFETY AND SECURITY
SECTION 28 46 00	FIRE DETECTION AND ALARM SYSTEM
SECTION 28 46 01	FIRE DETECTION AND ALARM SYSTEM VERIFICATION

END OF SECTION

PROJECT NAME: Nelson High School - Renovations
4181 New Street, Burlington, ON

RDZ PROJECT NUMBER: 23178

Following Supplementary Electrical Bid Form is submitted by:

.....

(Bidding Company)

.....

(Street Address or P. O. Box No.)

.....

(City, Province and Postal Code)

Dated And which is an integral part of Bid Form.

In accordance with Instructions to Bidders, we provide the Supplementary Electrical Bid Form. We understand that the information provided to be considered an integral part of Bid Form and is to be completed in full.

Where instructions are not provided, submit Supplementary Electrical Bid Form by time of Bid closing, via e-mail addressed to:

RDZ Engineers Ltd.
Attention: Tanweer Mozaffar
E-mail : tanweer@rdzeng.ca

Supplementary Bid Form Signature:

.....

(Signature of Authorized Representative)

.....

(Print Name)

.....

(Title)

A. LIST OF MANUFACTURERS/SUPPLIERS

We submit, herein, typed or neatly printed, the names of the manufacturers upon whose products our Bid Price is based and which we will supply. If no name is indicated, or if name identified is not listed in issued documents, or if more than one name is indicated for a particular product, we will if requested, provide the base specified manufacturer's product. Where products are named in the specifications with only one (1) manufacturer/supplier, or are not listed herein, we are also prepared to provide the base specified named product. We will provide Canadian manufactured products if costs and quality are similar.

We understand that the first manufacturer specified for any product is the manufacturer upon whose product the design is based, and that the other manufacturers specified for a particular product are manufacturers acceptable to the Owner and whose product produces equivalent quality, performance, and size. We further understand if we indicate a manufacturer other than the manufacturer whose product is the basis of the design, we are responsible for ensuring that the product supplied is equivalent in quality, performance, and size to the base design product, and that any additional costs incurred as a result of use of such products will be borne by us. Acceptance of non-base specified manufacturers with respect to their equivalency shall be as sole discretion of consultant.

We also acknowledge that failure to submit this list as specified or failure to submit within time defined may result in provision of base specified manufacturer's product, at discretion of consultant.

SECTION	PRODUCT	MANUFACTURER/SUPPLIER & CATALOGUE NUMBER
26 12 17	Dry Type Transformer	
26 24 16	Panel Boards	
26 24 17	Power Panels	
26 27 26	Wiring Devices	
26 28 23	Disconnect Switches-Fused and Non-Fused	
26 50 00	Lighting	
28 46 00	Fire Detection and Alarm System	

B. SUBCONTRACTORS

We enclose herewith a list of Subcontractors to the Electrical Building Services which is an integral part of the Bid. We agree that the Subcontractors shall not be changed without good reason and permission for same must be obtained from the Owner.

Section

Subcontractor

28 46 00 - Fire Detection and Alarm System _____

C. UNIT PRICES AND LABOUR RATES

We enclose herewith Unit Prices and Labour Rates which are an integral part of the Bid. Unit prices and labour rates are in effect for the duration of this Project's construction period. Owner is not obligated to accept unit prices and labour rates quoted.

1. Labour Rates:

Labour at the following rates shall be applied for additions or deletions to the work not covered by unit prices. The prices consist of salary, all agreed local union benefits. The rate quoted represents the net cost to the Contractor, exclusive of overhead and profit.

Journeyman \$/hour _____

Foreman \$/hour _____

2. Unit Prices:

The following unit costs will apply to all additional or deleted work from the Contract and should include their proportional share of all labour equipment, materials, accessories, profits, overhead and taxes for a job completely installed. Applications of unit prices will be to the net difference of quantities of individual products and materials in each contemplated Change Notice or Revision Notice.

3. The unit prices will be used for additions and deletions. Credit rate for deletions shall be at 80%

4. Conduit and Cable:

Supply and install the following conduit and cables including fastenings, clips, connectors, coupling boxes, etc. as required based on length as shown.

27mm Empty Conduit for length of 3500mm	\$ _____
2#12-16mmC for length of 3500mm	\$ _____
3#12-16mmC for length of 3500mm	\$ _____
2#10-21mmC for length of 3500mm	\$ _____
3#10-21mmC for length of 3500mm	\$ _____
3#8-21mmC for length of 3500mm	\$ _____

5. Receptacles:

Supply and installation of one duplex receptacle, shall include the receptacle box, cover plate, 3000mm of conduit and wiring, including connection to adjacent receptacle and/or outlet box.

\$ _____

6. Light Switches:

Supply and installation of one light switch shall include the switch box, cover plate, conduit, wiring and connection to box containing the lighting circuit.

\$ _____

7. Fire Alarm System:

Supply and installation of one fire alarm pull station, including conduits, wiring and connections, to the nearest fire alarm pull station based on 15000mm conduit and wiring length.

\$ _____

Supply and installation of one fire alarm cone speaker complete with strobe lights including, conduit, wiring and connections to nearest fire alarm cone speaker based on 15000mm conduit and wiring length.

\$ _____

8. Light Fixtures:
Supply and installation of the following lighting fixtures. The supply and installation of lighting fixtures shall include the fixtures, flexible conduit, wiring and connection to nearest outlet box containing 347 and/or 120volt circuits and the supply and installation of built-in drivers, 0-10V dimmers, etc. (Base conduit and wiring on 4500mm length).

- | | | |
|----|--|----------|
| .1 | Supply and installation of one type "A" | \$ _____ |
| .2 | Supply and installation of one type "AA" | \$ _____ |
| .3 | Supply and installation of one type "B" | \$ _____ |

END OF DOCUMENT

1. General

1.1 GENERAL

- .1 This Section covers items common to Sections of Division 26, Division 27, and Division 28. The General Conditions, Supplementary Conditions and Division 1 are a part of this Specification and shall apply to this Division. This section also supplements requirements of Division 1, Division 23, Division 27, Division 28, Division 33, and Division 34.
- .2 Issued for Construction documents are issued for Contractors' convenience for reference only and are a consolidation of issued drawings, specifications, and addenda. Consultant makes no representation of their completeness. Exact construction requirements to be based on official Bid issued drawings, specifications, and issued separate addenda. Contact Consultant for any clarifications.

1.2 APPLICATION

- .1 This Section specifies requirements that are common to Electrical Divisions work Sections, and it is a supplement to each Section and is to be read accordingly. Where requirements of this Section contradict requirements of Divisions 00 or 01, conditions of Division 00 or 01 to take precedence.
- .2 Mention herein, or indication on the Drawings of articles, materials, operations, or methods requires that all such items shall be provided in the quality and quantity required, and that the operations shall be performed according to the methods prescribed, complete with all necessary labour and incidentals.
- .3 These Specifications shall be considered as an integral part of the accompanying Drawings. Any item or subject omitted from either the Specifications or the Drawings, but which is mentioned or reasonably specified in the other shall be considered as properly and sufficiently specified and shall be provided.

1.3 REFERENCES

- .1 All work shall conform to the latest Codes, requirements and approval of the Authorities having jurisdiction and shall be subject to acceptance by the Consultant, and the following codes and standards:
 - OBC, Latest Edition and Local Building Department requirements.
 - Ontario Fire Marshall latest requirements.
 - OESC – Latest Edition
 - Electrical Safety Authority – Latest Inspection Bulletins
 - CSA C22.1, Canadian Electrical Code, Part 1 - Latest Edition

1.4 DEFINITIONS

- .1 The following are definitions of words found in Electrical Divisions of the Specification and on associated drawings:
 - .1 "concealed" – means hidden from normal sight in furred spaces, shafts, ceiling spaces, walls, and partitions.
 - .2 "exposed" – means work normally visible, including work in equipment rooms, service tunnels, and similar spaces.
 - .3 "finished" - means when in description of any area or part of an area or a product which receives a finish such as paint, or in case of a product may be factory finished.
 - .4 "provision" or "provide" (and tenses of "provide") – means supply and install complete. Include labour, materials, and services necessary to supply and install items or work referred to.

- .5 "install" (and tenses of "install") – means secure in position, connect complete, test, adjust, verify, and certify.
 - .6 "As instructed" or where instructed" – means as instructed by the Consultant including supplementary instruction notices and job site instruction notices.
 - .7 "listed" - means that the materials or equipment has been tested in accordance with applicable standards and methods and has been approved and listed for the intended use by a testing company approved by the Authorities having jurisdiction.
 - .8 "supply" – means to procure, arrange for delivery to site, inspect, accept delivery, and administer supply of products; distribute to areas; and include manufacturer's supply of any special materials, standard on site testing, initial start-up, programming, basic commissioning, warranties, and assistance to Contractor.
 - .9 "delete" or "remove" (and tenses of "delete" or "remove") – means to disconnect, make safe, remove obsolete materials and patch and repair/finish surfaces to match adjoining similar construction; include for associated re-programming of systems and/or change of documentation identifications to suit deletions, and properly dispose of deleted products off site unless otherwise instructed by consultant.
 - .10 "BAS" – means building automation system; "BMS" – means building management system, "FMS" – means facility management system; and "DDC" means direct digital controls; references to "BAS", "BMS", "FMS" and "DDC" generally mean same.
 - .11 "Governing authority" and/or "authority having jurisdiction" and/or "regulatory authority" and/or "Municipal authority" – means government departments, agencies, standards, rules, and regulations that apply to and govern work and to which work must adhere.
 - .12 "Mechanical Divisions" – refers to Divisions 20, 21, 22, 23, 25 and other Divisions as specifically noted, and which work as defined in Specifications and/or on drawings is responsibility of Mechanical Contractor, unless otherwise noted.
 - .13 "Electrical Divisions" – refers to Divisions 26, 27, 28 and other Divisions as specifically noted, and which work as defined in Specifications and/or on drawings is responsibility of Electrical Contractor, unless otherwise noted.
 - .14 "Approved" or "Approval" - means approved by Authorities having jurisdiction as conforming to Codes, Standards, By-Laws, etc.
 - .15 "Acceptable" or "Acceptance" – means acceptable to the Consultant as conforming together to the requirements of the contract documents.
 - .16 "Submit for Review" or "Submit Notice" – means submit to the Consultant.
 - .17 "Subject to Review" – means work shall be laid out for review by the Consultant. No work shall proceed until instructions have been obtained from the Consultant. Submit further information, shop drawings, samples etc. as specified and as may be requested by the Consultants.
 - .18 "Accessible" - means reachable by person with tools as required and where obstacles may be removed and replaced without cutting or breaking out materials.
 - .19 "board", "owner" - means School board.
- .2 Wherever words "indicated", "shown", "noted", "listed", or similar words or phrases are used in Contract Documents they are understood, unless otherwise defined, to mean product referred to is "indicated", "shown", "listed", or "noted" on Contract Documents.
 - .3 Wherever words "reviewed", "satisfactory", "as directed", "submit", or similar words or phrases are used in Contract Documents they are understood, unless otherwise defined, to mean that work or product referred to is "reviewed by", "to the satisfaction of", "submitted to", etc., Consultant.

1.5 DOCUMENTS

- .1 Documents for bidding include but are not limited to issued Drawings, Specifications and Addenda.

- .2 Drawings and Specifications are portions of Contract Documents and identify labour, products, and services necessary for performance of work and form a basis for determining pricing. They are intended to be cooperative. Perform work that is shown, specified, or reasonably implied on the drawings but not mentioned in Specification, or vice-versa, as though fully covered by both.
- .3 Read Drawings and Specifications in conjunction with documents of other Divisions and, where applicable, Code Consultant's report.
- .4 Unless otherwise specifically noted in Specifications and/or on Drawings, Sections of Electrical Divisions are not intended to delegate functions nor to delegate work and supply of materials to any specific trade, but rather to generally designate a basic unit of work, and Sections are to be read as a whole.
- .5 Drawings are performance drawings, diagrammatic, and show approximate locations of equipment and connecting services. Any information regarding accurate measurement of building is to be taken on site. Do not scale Drawings, and do not use Drawings for prefabrication work.
- .6 Drawings are intended to convey the scope of work and do not show architectural and structural details. Provide, at your cost, offsets, fittings, transformations, and similar products required as a result of obstructions and other architectural and/or structural details but not shown on Drawings.
- .7 Locations of equipment and materials shown may be altered, when reviewed by consultant, to meet requirements of equipment and/or materials, other equipment or systems being installed, and of building, all at no additional cost to Contract.
- .8 Specification does not generally indicate specific number of items or amounts of material required. Specification is intended to provide product data and installation requirements. Refer to schedules, Drawings (layouts, riser diagrams, schematics, details) and Specification to provide correct quantities. Singular may be read as plural and vice versa in Specification.
- .9 Starter/motor control centre (MCC)/variable frequency drive (VFD) schedule drawings are both mechanical and electrical and apply to work of Mechanical Divisions and Electrical Divisions. Be responsible for reviewing starter, MCC, VFD, and motor specification requirements prior to Bid submission and confirm exact scope of work and responsibility of work between Mechanical Divisions and Electrical Divisions.
- .10 Drawings and Specifications have been prepared solely for use by party with whom Consultant has entered a contract and there are no representations of any kind made by consultant to any other party.
- .11 When scale and date of Drawings are the same, or when discrepancy exists within Specification, include most costly arrangement to take precedence.
- .12 Unless otherwise specified in Division 00, Division 01, or "General Conditions", in the case of discrepancies or conflicts between Drawings and Specification, documents will govern in following order:
 - .1 Specification.
 - .2 Drawings of larger scale.
 - .3 Drawings of smaller scale.
 - .4 Drawings of later date when scale of Drawings is same.

1.6 IMPERIAL AND METRIC MEASUREMENTS

- .1 Generally, both metric and imperial units of measurement are given in Sections of Specification governed by this section. Measurement conversions may be generally "soft" and rounded off. Exact measurements to be confirmed based on application. Where measurements are related to installation and onsite applications, confirm issued document measurements with applicable local code requirements, and/or as applicable, make accurate measurements onsite. Where significant discrepancies are found, immediately notify Consultant for direction.

1.7 EXAMINATION OF DOCUMENTS AND EXISTING SITE CONDITIONS

- .1 Carefully examine Documents and visit site to determine and review existing site conditions that will or may affect work and include for such conditions in Bid Price.
- .2 Carefully examine electrical, structural, mechanical, and architectural drawings, and fully understand the functioning of the system described and specified under this Section. If in doubt, contact the engineer before submitting the Bid Price.
- .3 Report to Consultant, prior to Bid Submittal, any existing site condition that will or may affect performance of work as per Documents. Failure to do so will not be grounds for additional costs.
- .4 Upon finding discrepancies in, or omissions from Documents, or having doubt as to their meaning or intent, immediately notify Consultant, in writing.

1.8 WORK STANDARDS

- .1 Where any code, regulation, bylaw, standard, contract form, manual, printed instruction, and installation and application instruction are quoted it means, unless otherwise specifically noted, latest published edition at time of submission of Bids adopted by and enforced by local governing authorities having jurisdiction. Include for compliance with revisions, bulletins, supplementary standards, or amendments issued by local governing authorities.
- .2 Where regulatory codes, standards and regulations are at variance with Drawings and Specification, more stringent requirement will apply unless otherwise directed by consultant.
- .3 Supplementary mandatory specification and requirements to be used in conjunction with project include but are not limited to following:
 - .1 Ontario Building Code (OBC)
 - .2 Electrical Safety Authority (ESA)
 - .3 Ontario Electrical Safety Code (OESC)
 - .4 Canadian Standards Association (CSA)
 - .5 Underwriters' Laboratories of Canada (ULC)
 - .6 National Standards of Canada (CAN)
 - .7 National Building Code of Canada (NBC)
 - .8 National Fire Protection Association (NFPA)
 - .9 American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., (ASHRAE)
 - .10 National Electrical Manufacturers Association (NEMA)
 - .11 Electrical and Electronic Manufacturers Association of Canada (EEMAC)
 - .12 American National Standards Institute (ANSI)
 - .13 Illuminating Engineering Society (IES)
 - .14 Building Industry Consulting Services, International (BICSI)
 - .15 Electronic Industries Association (EIA)
 - .16 Canadian General Standards Board (CGSB)
 - .17 Institute of Electrical and Electronic Engineers (IEEE)

- .18 Occupational Health and Safety Act (OHSA)
 - .19 Technical Standards and Safety Authority (TSSA)
 - .20 Workplace Hazardous Materials Information System (WHMIS)
 - .21 International Standards Organization (ISO)
 - .22 Material Safety Data Sheets by product manufacturers.
 - .23 Local utility inspection permits.
 - .24 Codes, standards, and regulations of local governing authorities having jurisdiction.
 - .25 Additional codes and standards listed in Trade Sections.
 - .26 Owner's standards.
- .4 Provide applicable requirements for barrier free access in accordance with latest edition of local governing building code.
 - .5 Where any governing Code, Regulation, or Standard requires preparation and submission of special details or drawings for review they are to be prepared and submitted. Pay associated costs associated with these submittals.
 - .6 Unless otherwise specified, equipment is to be installed in accordance with the equipment manufacturer's recommendations and instructions, and requirements of governing Codes, Standards, and Regulations. Governing Codes, Standards, and Regulations take precedence over manufacturer's instructions.
 - .7 Work is to be performed by journeyperson tradesmen who perform only the work that their certificates permit, or by apprentice tradesmen under direct on-site supervision of an experienced journeyperson tradesman. Journeyperson to apprentice ratio is not to exceed ratio determined as stated in Ontario College of Trades and Apprenticeship Act.
 - .8 Journeyperson tradesmen are to have a copy of valid trade certificates available at site for review by consultant at any time.
 - .9 Experienced and qualified superintendent is to be on-site at times when work is being performed.
 - .10 Coordinate work inspection reviews and approvals with governing inspection department to ensure that construction schedule is not delayed. Be responsible for prompt notification of deficiencies to consultant and submission of reports and certificates to consultant.
 - .11 Properly protect equipment and materials on site from damage due to elements and work of trades, to satisfaction of consultant. Equipment and materials are to be in new condition upon Substantial Performance of the Work.
 - .12 Electrical equipment and devices shall be certified and bear stamp or seal of a recognized testing agency such as CSA, UL, ULC, ETL, etc., or bear a stamp to indicate special electrical utility approval.
 - .13 Makes and quality of the materials used shall be approved by the Consultants and authority having jurisdiction.
 - .14 Products and materials provided shall be new and free from all defects. Related materials shall be of the same manufacturer throughout the Project.
 - .15 Products and materials called for on the drawings or in the specifications by trade names, manufacturer names and catalogue reference are those which shall be used based on the Tender.
 - .16 Alternative products and materials to those specified shall only be considered if they are shown in the Tender as a material variation with an appropriate price adjustment. The Consultant reserves the right to accept or reject any alternative without explanation.

- .17 Assume full responsibilities for ensuring that when providing alternative products or materials, all space, weight, connections, power, and wiring requirements, etc., are considered. Any costs incurred for additional components, changes to services, structural or space requirements, layouts, and plans, etc., that may be necessary will be borne by this Division.
- .18 Materials or equipment rejected by the Consultants shall be immediately removed from the project and suitable materials shall be provided.

1.9 PERMITS, CERTIFICATES AND FEES

- .1 Contact and confirm with local authorities having jurisdiction including utility providers, requirements for approvals from such authorities. Obtain and pay for permits, certificates, and approvals required to complete Work.
- .2 Be responsible for ensuring that authorities having jurisdiction which require on-site inspection of work, have ample notification to perform inspection, with sufficient lead time to correct deficiencies in a manner that will not impede schedule of completion of Work.
- .3 Submit to Consultant, approval/inspection certificates issued by governing authorities to confirm that Work as installed is in accordance with rules and regulations of local governing authorities.
- .4 Include in each copy of operating and maintenance instruction manuals, copies of approvals and inspection certificates issued by regulatory authorities to certify that completed Work is in accordance with regulations of regulatory authorities and is acceptable to them.

1.10 REQUIREMENTS FOR CONTRACTOR RETAINED ENGINEERS

- .1 Professional engineers retained to perform consulting services with regards to Project work, i.e., seismic engineer, fire protection engineer, structural engineer, are to be members in good standing with local Association of Professional Engineers and are to carry and pay for errors and omissions professional liability insurance in compliance with requirements of governing authorities in Place of the Work.
- .2 Retained engineer's professional liability insurance is to protect Contractor's Consultants and their respective servants, agents, and employees against any loss or damage resulting from professional services rendered by aforementioned Consultants and their respective servants, agents, and employees in regard to the Work of this Contract.
- .3 Liability insurance requirements are as follows:
 - .1 coverage is to be a minimum of \$1,000,000.00 inclusive of any one occurrence.
 - .2 insurance policy is not to be cancelled or changed in any way without insurer giving Owner minimum thirty days written notice.
 - .3 liability insurance is to be obtained from an insurer registered and licensed to underwrite such insurance in the Place of the Work.
 - .4 retained Consultants are to ascertain that Sub-Consultants employed by them carry insurance in the form and limits specified above.
 - .5 evidence of the required liability insurance in such form as may be required is to be issued to Owner, Owner's Consultant, and Municipal Authorities as required prior to commencement of aforementioned Consultant's services.

1.11 WORKPLACE SAFETY

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials. Submit WHMIS MSDS (Material Safety Data Sheets) for products where required and maintain one copy at site in a visible and accessible location available to personnel.
- .2 Comply with requirements of Occupational Health and Safety Act and other regulations pertaining to health and safety, including worker's compensation/insurance board and fall protection regulations. When working in confined spaces, comply with requirements of Occupational Health and Safety Act - Ontario Regulation 632, "Confined Spaces".

1.12 PLANNING AND LAYOUT OF WORK

- .1 Base installation layout, design, terminations, and supply of accessories, on Contract Documents with specific coordination with reviewed shop drawings.
- .2 Plan, coordinate, and establish exact locations and routing of services with affected trades prior to installation such that services clear each other as well as other obstructions. Generally, order of right of way for services to be as follows:
 - .1 large ducts (main runs)
 - .2 cable tray and bus duct
 - .3 conduit 100 mm (4") dia. and larger
 - .4 smaller branch ductwork
 - .5 conduit less than 100 mm (4") dia.
- .3 Unless otherwise shown or specified, conceal work in finished areas, and conceal work in partially finished and/or unfinished areas to extent made possible by the area construction. Install services as high as possible to conserve headroom and/or ceiling space. Notify Consultant where headroom or ceiling space appears to be inadequate prior to installation of the work.
- .4 Do not use Contract Drawing measurements for distribution equipment layout, conduit installation work and such other work. Locations and routing are to generally be in accordance with Contract Drawings, however, prepare layout drawings for such work. Use established benchmarks for both horizontal and vertical measurements. Coordinate with and make allowances for work of other trades. Accurately layout work and be entirely responsible for work installed in accordance with layout drawings. Where any grade or size is at variance with Contract Drawings, notify Consultant prior to proceeding with work.
- .5 Prepare plan and interference drawings (at a minimum drawing scale of 1:50 or ¼"=1' 0") of the work for coordination with General Contractor. Arrange for preparation of detailed section drawings of ceiling spaces of corridors and any other congested areas. Sections are to be cross referenced with plan drawings so that trades may make use of section drawings. Section drawings to indicate lateral and elevation dimensions of major services within ceiling space. Lateral dimensions are to be from grid lines and elevations from top of floor slab. Obtain from Consultant, disks of engineering drawings for this use. Prints and/or disks of Contractors' interference drawings are to be distributed among other Trade Contractors and General Contractor. Submit drawings to consultant for review. Failure of General Contractor to prepare and coordinate overall interface drawings of trades does not relieve respective Division Contractor of responsibility to ensure that work is properly planned and coordinated.
- .6 Carry out alterations in arrangement of work that has been installed without proper coordination, study, and review, even if in accordance with Contract Documents, in order to conceal work behind finishes, or to allow installation of other work, without additional cost. In addition, make necessary alterations in other work required by such alterations, without additional cost.

- .7 Junction boxes for lighting, power, fire alarm, power packs, lighting controllers and such other systems devices and products located above suspended ceilings must be located for easy access for servicing and/or removal. Products which do not meet this location requirement are to be relocated to an accessible location at no additional cost.
- .8 Be responsible for making necessary changes, at no additional cost, to accommodate structural and building conditions that were missed due to lack of coordination by this Division.

1.13 COORDINATION OF THE WORK

- .1 Fully understands the functions of the systems specified and have no doubts regarding the extent of the Contract.
- .2 Examine the Architectural, Structural, Mechanical and Electrical drawings and become fully familiar with the work of other Divisions.
- .3 Co-ordinate with all Divisions providing equipment and services and ensure that there is no conflict. Coordination requirements are to include but not be limited to following:
 - .1 requirements for openings, sleeves, inserts and other hardware necessary for installation of work.
 - .2 concrete work such as housekeeping pads, sumps, bases, etc., required for work, and including required dimensions, operating weight of equipment, location, etc.
 - .3 depth and routing of excavation required for work, and requirements for bedding and backfill.
 - .4 wiring work required for equipment and systems but not specified to be done as part of mechanical work, including termination points, wiring type and size, and any other requirements.
- .4 Ensure materials and equipment are delivered to site at proper time and in such assemblies and sizes to enter building and be moved into spaces where they are to be located without difficulty.
- .5 Wherever possible, coordinate equipment deliveries with manufacturers and/or suppliers so equipment is delivered to site when it is required, or so it can be stored within building and protected from elements.
- .6 Ensure proper access and service clearances are maintained around equipment, and, where applicable, access space for future equipment removal or replacement is not impeded. Comply with code requirements with regards to access space provision around equipment. Remove and replace any equipment which does not meet this requirement.
- .7 Arrange equipment in proper relation with other apparatus, the building construction, the Architectural finish and with all work specified.
- .8 Where space is shown for future equipment leave such space clear and ensure that the necessary connections can be made to the future equipment.
- .9 Where work is to be integrated or is to be installed in close proximity with work of other trades, coordinate work prior to and during installation.
- .10 Failures to fully understand Drawings and allow for the work of other Divisions or where relocations are necessary due to lack of co-ordination between Divisions shall be remedied at the expense of this Division.

1.14 WORKMANSHIP

- .1 All work shall be executed in a workmanlike manner and present a neat mechanical appearance.

1.15 EQUIPMENT AND MATERIALS

- .1 Be responsible for ordering of products (equipment and materials) in a timely manner to meet project-scheduling timelines. Failure to order products to allow manufacturers sufficient production/delivery time to meet project-scheduling timelines is an unacceptable reason to request for other suppliers or substitutions.
- .2 Provide Canadian manufactured products wherever possible and where required quality and performance is obtainable. Unless otherwise specified, all materials and apparatus shall be new and shall comply with applicable Canadian Standards Association (CSA) Standards and/or Underwriters Laboratories of Canada (ULC) Standards and the requirements of the authorities having jurisdiction.
- .3 Materials and equipment scheduled and/or specified, have been selected to establish a performance and quality standard, and, in some instances, a dimensional standard. In most cases, base specified manufacturers are stated for material and equipment, specified by manufacturer's name and model number. Unless otherwise noted, the Bid Price may be based on materials and equipment supplied by any of the manufacturers named as acceptable for the particular material or equipment. If acceptable manufacturers are not stated for a particular material or piece of equipment, base the Bid Price on material supplied by the base specified manufacturers.
- .4 Documents have been prepared based on product available at time of Bidding. If, after award of Contract, and if successful manufacturer can no longer supply a product that meets base specifications, notify Consultant immediately. Be responsible for obtaining other manufacturers product that complies with base specified performance and criteria and meets project timelines. Proposed products are subject to review and consideration by consultant and are considered as substitutions subject to a credit to Contract. In addition, if such products require modifications to room spaces, mechanical systems, electrical systems, etc., include required changes. Such changes are to be submitted in detail to consultant for review and consideration for acceptance. There will be no increase in Contract Price for revisions. Note that above conditions supplement and are not to supersede any specification conditions with regards to substitutions or failure to supply product as per issued documents.
- .5 If materials or equipment supplied by a manufacturer named as acceptable are used in lieu of the manufacturer specified, be responsible for ensuring that the substituted material or equipment is equivalent in quality, performance and operating characteristics (including energy consumption if applicable) to the specified materials or equipment, and, it shall be understood that any additional costs, and changes to associated or adjacent work resulting from provision of materials supplied by a manufacturer other than the specified manufacturer is included in the Bid Price. In addition, in equipment spaces where equipment named as acceptable is used in lieu of specified equipment and the dimension of such equipment differs from the specified equipment, prepare, and submit for review, accurately dimensioned layouts of rooms affected.
- .6 In addition to the manufacturers specified or named as acceptable, other manufacturers of materials or equipment may be proposed to the Consultant for acceptance, listing in each case a corresponding credit for each alternative proposed, however, the Bid Price must be based on equipment or materials specified or named as acceptable. Certify in writing to the Consultant that the proposed alternative meets all space, power, design, energy consumption, and all other requirements of the specified or acceptable material or equipment. In addition, it shall be understood that there will be no increase in the contract Price by reason of any changes to associated equipment, mechanical and/or electrical, required by acceptance of proposed alternatives. The Consultant has sole discretion in accepting any such proposed alternative material or equipment.

- .7 Where products you intend to provide are proposed as "an equal" and/or "or approved equal", to specified products, certify in writing that the proposed product to be used in lieu of specified product, at least meets space, power, design, energy consumption, noise criteria and other requirements of the specified product and thus shall be equivalent to or better than the specified product. When requested by the Consultant, provide full design detail drawings and specifications of proposed products. Acceptance of these "or equal" and/or "or approved equal" products shall be at the sole discretion of the Consultant. The Consultant's decision shall be final and shall not require explanation. There shall be no increase in the contract Price due to the Consultant's rejection of a proposed equivalent product.
- .8 Only base specified products specified acceptable products or equipment listed as alternate will be considered for acceptance by the owner. No proposed substitutions will be accepted.
- .9 Indicate in Form of Supplementary Electrical Tender, names of manufacturers for proposed products to be supplied, and which were based specified or scheduled with a manufacturer's name. Names of proposed manufacturers on list must be one of names stated as acceptable for products unless prior approval from Owner has been given for use of products by other manufacturers. Submit to Consultant for review as directed.

1.16 SHOP DRAWINGS

- .1 At start-up meeting, confirm with consultant products to be included in shop drawing submission. Prepare and submit list of products to consultant for review.
- .2 Submit for review, drawings showing in detail design, construction, and performance of equipment and materials as requested in Specification. Submit shop drawings to consultant for review prior to ordering and delivery of product to site. Include minimally for preparation and submission of following, as applicable:
 - .1 Product literature cuts.
 - .2 Equipment data sheets.
 - .3 Equipment dimension drawings.
 - .4 System block diagrams.
 - .5 Sequence of operation.
 - .6 Connection wiring schematic diagrams.
 - .7 Functionality with integrated systems.
- .3 Each shop drawing or product data sheet is to be properly identified with project name and product drawing or specification section reference. Shop drawing or product data sheet dimensions are to match dimension type on drawings.
- .4 Where any item of equipment is required by Code or Standard or By-Law to meet a specific energy efficiency level, or any other specific requirement, ensure this requirement is clearly indicated on submission.
- .5 Ensure proposed products meet each requirement of Project. Endorse each shop drawing copy "CERTIFIED TO BE IN ACCORDANCE WITH ALL REQUIREMENTS". Include company name, submittal date, and sign each copy. Shop drawings that are received and are not endorsed, dated, and signed will be returned to be resubmitted. Submit electronic copies of shop drawings unless otherwise directed by consultant. Confirm exact requirements with consultant.
- .6 Approval of a drawing by this Division implies the following:
 1. The drawing has been checked by the person making the approval.
 2. The equipment or material complies in all respects with the requirements of the specifications and drawings.

3. The quantities, if indicated on the drawing, are correct.
 4. The physical dimensions of the components are such that they can be installed without interference with the building structure or other equipment, and that, after installation, there are sufficient clearances on all sides for the maintenance, servicing, and operation of the equipment.
 - .7 Consultant will review shop drawings and indicate review status by stamping shop drawing copies as follows:
 - .1 "REVIEWED" or "REVIEWED AS NOTED" (appropriately marked) – If Consultant's review of shop drawing is final, Consultant to stamp shop drawing.
 - .2 "REVISE AND RESUBMIT" – If Consultant's review of shop drawing is not final, Consultant to stamp shop drawing as stated above, mark submission with comments, and return submission. Revise shop drawing in accordance with Consultant's notations and resubmit.
 - .8 Following is to be read in conjunction with wording on Consultant's shop drawing review stamp applied to each shop drawing or product data sheet submitted:

"THIS REVIEW BY CONSULTANT IS FOR THE SOLE PURPOSE OF ASCERTAINING CONFORMANCE WITH GENERAL DESIGN CONCEPT. THIS REVIEW DOES NOT MEAN THAT CONSULTANT APPROVES DETAIL DESIGN INHERENT IN SHOP DRAWINGS, RESPONSIBILITY FOR WHICH REMAINS WITH CONTRACTOR, AND SUCH REVIEW DOES NOT RELIEVE CONTRACTOR OF RESPONSIBILITY FOR ERRORS OR OMISSIONS IN SHOP DRAWINGS OR OF CONTRACTOR'S RESPONSIBILITY FOR MEETING REQUIREMENTS OF CONTRACT DOCUMENTS. BE RESPONSIBLE FOR DIMENSIONS TO BE CONFIRMED AND CORRELATED AT JOB SITE, FOR INFORMATION THAT PERTAINS SOLELY TO FABRICATION PROCESSES OR TO TECHNIQUES OF CONSTRUCTION AND INSTALLATION, AND FOR COORDINATION OF WORK OF SUB-TRADES."
 - .9 Resubmit any drawing on which notations have been made, after it has been modified or corrected.
 - .10 Drawings that are re-submitted shall have a distinct notation of the fact made on each drawing.
 - .11 Works shall not proceed on any equipment, material or installation until the drawings have been reviewed by the Consultant.
 - .12 Each system and each major component are to be separate shop drawing submissions. Shop drawings for common devices such as devices of each system are to be submitted together.
 - .13 Obtain shop drawings for submission from product manufacturer's authorized representatives and supplemented with additional items specified herein.
 - .14 Where extended warranties are specified for equipment items, submit specified extended warranty with shop drawing submittal.
- 1.17 EQUIPMENT LOADS
- .1 Supply equipment loads (self-weight, operating weight, housekeeping pad, inertia pads, etc.) to consultant, via shop drawing submissions, prior to construction.
 - .2 When choice of specific equipment is made by Contractor, actual weight, location, and method of support of equipment may differ from those initially given to consultants and thus from those assumed for design. Consequently, it is necessary to back-check equipment loads, location, and supports.

- .3 Where supporting structure consists of structural steel framing, it is imperative that equipment loads, location, and method of support be confirmed prior to fabrication of structural steel. Be responsible for confirming locations of equipment with consultant prior to construction.

1.18 OPENINGS

- .1 Supply opening sizes and locations to consultant to allow verification of their effect on design, and for inclusion on structural drawings where appropriate.
- .2 No openings are permitted through completed structure without written approval of consultant. Show required openings on a copy of structural drawings. Identify exact locations, elevations, and size of proposed openings and submit to consultant for review, well in advance of doing work.
- .3 Chases, openings, cutting, patching, etc. shall be provided by this Division in accordance with those sections of the specification detailing the requirements.
- .4 Flashing required for openings in walls, floors and roofs shall, unless otherwise noted, be provided by this Division.
- .5 Electrical conduit roof flashing shall be similar to National Roofing supply product code# ECP-PVCH (electrical conduit post PVCH), Gooseneck S.S.A ARPGN2 (2")/ ARPGN3 (3").
- .6 Drilling for hangers, rods, inserts and work of a similar nature shall be provided by this Division.
- .7 Provide all necessary sleeves, inserts, anchor bolts, etc., prior to pouring of concrete or building of walls, roofs, etc.
- .8 Advise the extent of such work and supply all information and details as to sizes and locations within thirty days after the award of the Contract.
- .9 Failures to comply with the above requirements shall be remedied at this Division's expense.
- .10 Where conduits pass through fire rated walls/ areas, proper fire stop material shall be used by Division 26. Submit shop drawings for review before installation.

1.19 SCAFFOLDING, RIGGING, AND HOISTING

- .1 Unless otherwise specified or directed, supply, erect and operate scaffolding, rigging, hoisting equipment and associated hardware required for work, and subject to review by and coordination with consultant.
- .2 Immediately remove from site scaffolding, rigging and hoisting equipment when no longer required.
- .3 Do not place major scaffolding/hoisting equipment loads on any portion of structure without approval from consultant.

1.20 TEMPORARY CRANES

- .1 Submit following to consultant for review:
 - .1 Propose details showing existing structures and surfaces being used for lifting locations.
 - .2 Copies of approvals of authorities for work.
 - .3 Copies of approvals of property management of buildings affected by hoisting work, allowing for work.
 - .4 Copies of required insurance for work.

1.21 CHANGES OR REVISIONS TO THE WORK

- .1 Whenever Consultant proposes in writing to make a change or revision to design, arrangement, quantity, or type of work from that required by Contract Documents, prepare, and submit to consultant for approval, a quotation being proposed cost for executing change or revision.
- .2 Quotation is to be a detailed and itemized estimate of product, labour, and equipment costs associated with change or revision, plus overhead and profit percentages and applicable taxes and duties.
- .3 If overhead and profit percentages are not specified in Division 00 or 01, but allowable under Contract as confirmed with consultant prior to contract signing, then allowable maximum percentages for overhead and profit are to be 7% and 5% respectively.
- .4 Unless otherwise specified in Divisions 00 or 01, following requirements apply to all quotations submitted:
 - .1 When change or revision involves deleted work as well as additional work, cost of deleted work (less overhead and profit percentages but including taxes and duties) is to be subtracted from cost of additional work before overhead and profit percentages are applied to additional work.
 - .2 Material costs are not to exceed those published in local estimating price guides.
 - .3 Electrical material labour unit costs are to be in accordance with National Electrical Contractors Association Manual of Labour Units.
 - .4 Costs for journeyman and apprentice labour must not exceed prevailing rates at time of execution of Contract and must reflect actual personnel performing work.
 - .5 Cost for site superintendent must not exceed 10% of total hours of labour estimated for change or revision and change or revision must be such that site superintendent's involvement is necessary.
 - .6 Costs for rental tools and/or equipment are not to exceed local rental costs.
 - .7 Overhead percentage will be deemed to cover quotation costs other than actual site labour and materials, and rentals.
 - .8 Quotations, including those for deleted work, to include a figure for any required change to Contract time.
- .5 Quotations submitted that are not in accordance with requirements specified above will be rejected and returned for re-submittal. Failure to submit a proper quotation to enable Consultant to expeditiously process quotation and issue a Change Order will not be grounds for any additional change to Contract time.
- .6 Make requests for changes or revisions to work to Consultant in writing and, if Consultant agrees, will issue Notice of Change.
- .7 Do not execute any change or revision until written authorization for the change or revision has been obtained from consultant.

1.22 BREAKDOWN OF ELECTRICAL WORK COST

- .1 Prior to submittal of first progress payment draw, submit a detailed breakdown of work cost to assist Consultant in reviewing and approving progress payment claims.
- .2 Payment breakdown is subject to Consultant's approval and progress payments will not be processed until an approved breakdown is in place. Breakdown is to include one-time claim items such as mobilization and demobilization, insurance, bonds (if applicable), shop drawings and product data sheets, commissioning including system testing and verification, and project closeout submittals.

- .3 Indicate equipment, material, and labour costs for site services (if applicable) and indicate work of each trade in same manner as indicated on progress draw.

1.23 NOTICE FOR REQUIRED FIELD REVIEWS

- .1 Whenever there is a requirement for consultant to perform a field review prior to concealment of any work, to inspect/re-inspect work for deficiencies prior to Substantial Performance of the Work, for commissioning demonstrations, and any other such field review, give minimum 5 working days' notice in writing to consultant.
- .2 If Consultant is unable to attend a field review when requested, arrange an alternative date and time.
- .3 Do not conceal work until consultant advises that it may be concealed.
- .4 When Consultant is requested to perform a field review and work is not ready to be reviewed, reimburse Consultant for time and travel expenses.

1.24 PRELIMINARY TESTING

- .1 When directed by consultant, promptly arrange, pay for, and perform site tests on any piece of equipment or any system for such reasonable lengths of time and at such times as may be required to prove compliance with Specification and governing Codes and Regulations, prior to Substantial Performance of the Work.
- .2 When, in Consultant's opinion, tests are required to be performed by a certified testing agency, arrange, and pay for such tests.
- .3 These tests are not to be construed as evidence of acceptance of work, and it is agreed and understood that no claim for delays or damage will be made for injury or breakage to any part or parts of equipment or system due to test where such injuries or breakage were caused by faulty parts and/or workmanship of any kind.
- .4 When, in Consultant's opinion, tests indicate that equipment, products, etc., are defective or deficient, immediately remove such equipment and/or products from site and replace them with acceptable equipment and/or products, at no additional cost.

1.25 PROVISIONS FOR SYSTEMS/EQUIPMENT USED DURING CONSTRUCTION

- .1 Confirm with Consultant what equipment can be used during construction.
- .2 Any system or piece of equipment that is specified to be provided under requirements of Documents and is required to be used during construction stages of work prior to issuing of Certificate of Substantial Performance of the Work, are to be provided with special interim maintenance and service to cover systems/equipment during time of use during construction period of project until project has been certified as substantially performed and such systems/equipment are turned over to Owner.
- .3 During this period of construction, such systems/equipment to not become property of Owner or be Owner's responsibility for maintenance or service. Systems/equipment are to remain property of respective manufacturers/suppliers or Contractor, who are responsible for full maintenance and servicing of systems/equipment in order to maintain validity of warranties after turning over to Owner.
- .4 Prior to application for a Certificate of Substantial Performance of the Work and turn over to Owner, such systems/equipment to be cleaned, restored to "new" condition, paint finishes "touched-up" etc.

1.26 MAINTAINING EQUIPMENT PRIOR TO ACCEPTANCE

- .1 Maintain equipment in accordance with the manufacturer's printed instructions prior to start-up, testing, and commissioning.

1.27 PROTECTION

- .1 Protect all finished and unfinished work from damage due to carrying out the work specified.
- .2 Repair all damage resulting from execution of the work to the satisfaction of the Consultant.
- .3 Should the project be stopped for any cause, provide all necessary protection to prevent damage by weather or other causes while such stoppage exists.

1.28 HANDLING AND STORAGE

- .1 Materials and equipment shall be handled and stored in such a manner so that no damage shall be done to the materials, the structure of the building or surrounding property.
- .2 Packaged or bundled materials and equipment shall be stored in dry weathertight secure enclosures in original undamaged condition with manufacturer's seals and labels intact.
- .3 All metals shall be protected against corrosion and bending.
- .4 Storage of materials, equipment etc. in the building structure shall not be permitted unless otherwise noted.

1.29 MINOR FIELD CHANGES

- .1 The location, arrangement and connection of equipment and materials as shown on the drawings represents a close approximation to the intent and requirements of the Contract.
- .2 The right is reserved to make reasonable changes required to accommodate conditions arising during the progress of the work. Such changes, if made prior to the installation, shall be done at no additional cost, unless the location, arrangement or connection is more than six feet from that shown on the drawings.

1.30 CLEANING UP

- .1 During construction, and daily, keep the site reasonably clear of rubbish and waste material resulting from electrical work to the satisfaction of the Consultant. Before applying for a Certificate of Substantial Performance of the Work, remove all rubbish and debris, and arrange for and pay for the repair of any damage caused as a result of electrical work.
- .2 Clean the interior and exterior of all equipment and remove any debris during construction.
- .3 Inspect and clean all systems and equipment prior to energizing and ensure that they are safe.

Perform a complete and thorough clean-up to the exterior and interiors of all systems and equipment before the final inspection. The interiors shall be cleaned using an industrial vacuum cleaner.

1.31 ELECTRICAL CONDUCTOR FIRE PROTECTION

- .1 Fire rated enclosures shall be provided to form service spaces for conduits containing electrical conductors for emergency power, elevators, and life safety equipment in accordance with the requirements of the Authorities having jurisdiction.
- .2 Fire rated access panels shall be provided in the enclosures where required.

- .3 The fire rated enclosures required by this Division shall, unless otherwise noted, be provided by this Division and shall be in accordance with the sections of the specification detailing the fire rated enclosures requirements.
- .4 Advise the extent of the fire rated enclosures required and supply all information and details as to size and locations within thirty days after the award of the contract.
- .5 Failures to comply with the above requirements shall be remedied at this Division's expense.
- .6 Where fire rated cables, that comply with the requirements of the Authorities having jurisdiction, are provided it shall not be required that they be installed in fire rated enclosures.

1.32 SPRINKLER PROOF EQUIPMENT

- .1 Where sprinklers are installed; electrical equipment shall be constructed so that water from the sprinkler heads shall not impair the effectiveness of the equipment.
- .2 A separate and complete roof shall be provided on free standing or surface mounted equipment. An overhang at the front, rear and sides shall prevent the entrance of water either at the top or through projecting face plates, meters, etc. Provide complete gaskets to suit.
- .3 Where openings are required in the roofs or sides of incoming and outgoing conduits and cables, removable gasketed plates shall be provided and the conduits and cables shall be installed using waterproof fittings. The plates are to be grounded by a separate copper strap to the equipment.
- .4 Distribution and power panels, panel boards, etc. and switchboards shall be complete with gaskets and doors.

1.33 EQUIPMENT AND MATERIAL COLOURS

- .1 Where materials and equipment are specified to be a specific colour, a sample of the colour proposed by the manufacturer shall be submitted with the shop drawing.
- .2 Where materials and equipment are specified to be of colours as selected by the Consultant, these shall be determined during the Contract. Obtain the colour requirements from the Consultant prior to submitting shop drawings so that the appropriate sample of the colour can be submitted with the shop drawings.

1.34 SLEEVES

- .1 Provide sleeves of galvanized steel pipe with machine cut ends of ample size to accommodate conduits passing through walls, partitions, ceilings, floors, etc.
- .2 For wall partitions and ceilings, the ends of the sleeves shall be flush with the finish on both sides. For floors they shall extend 50mm above and below finished floor level.
- .3 The space between the sleeve and the conduit and spare sleeves shall be filled with Dow Corning silicone RTV foam for fire stop. Caulk around the top and bottom with approved permanently resilient, non-flammable and weatherproof silicone base compound.

1.35 EXCAVATION AND BACKFILL

- .1 The excavation and backfill required by this Division shall, unless otherwise noted, be provided by this Division and shall be in accordance with the Sections of the Specification detailing the excavation and backfill requirements.

- .2 Advise the extent of the excavation and backfill work required by this Division and supply all information and details as to size and locations within thirty days after the award of the Contract.
- .3 Failures to comply with the above requirements shall be remedied at this Division's expense.

1.36 HOUSEKEEPING PAD

- .1 All floor mounted electrical equipment installed by this Division shall be mounted on concrete housekeeping pads which shall, unless otherwise noted, be provided by this Division.
- .2 Advise the extent of the housekeeping pads required by this Division and supply all information and details as to size and location within thirty days after the award of the Contract.
- .3 Failures to comply with the above requirements shall be remedied at this Division's expense.

1.37 CONCRETE

- .1 The concrete and reinforcing required by this Division shall, unless otherwise noted, be provided by this Division and shall be in accordance with the Sections of the Specifications detailing the concrete and reinforcing requirements.
- .2 Advise the extent of the concrete and reinforcing work required by this Division and supply all information and details as to size and locations within thirty days after the award of the Contract.
- .3 Failures to comply with the above requirements shall be remedied at this Division's expense.

1.38 PAINTING

- .1 All equipment shall be supplied with manufacturer's standard finish coat, unless otherwise noted.
- .2 All supports, hangers, etc. provided or fabricated by this Division shall be painted with two coats of zinc chromate primer.
- .3 Where the finish on any materials or equipment installed by this Division is damaged, it shall be touched-up, completely repainted or replaced to the satisfaction of the Consultant.

1.39 IDENTIFICATIONS

- .1 Identify each item of equipment installed by this Division, whether supplied by it or not.
- .2 Metal surfaces shall be thoroughly cleaned before application of identification.
- .3 Identifications shall be installed after painting has been completed and shall be secured with self-tapping screws or rivets except when installed on the inside of doors when gluing will be acceptable.
- .4 Manufacturer's nameplates shall be affixed to each item supplied showing the size, name of equipment, serial number and all information usually provided including voltage, cycle, phase, horsepower, etc., and the name of the Manufacturer and his address. Ensure that all stamped, etched, or engraved lettering on plates is perfectly legible. Do not paint over nameplates and where equipment is to be concealed attach the nameplates in an accessible location.
- .5 Panels and all other equipment which have exposed faces in finished areas shall not have any visible trademarks or other identifying symbols. Nameplates shall be mounted on the inside of the doors.
- .6 Each lighting panel shall have a directory mounted on the inside of the door behind a protective plastic screen. The directories shall be typewritten and shall identify each branch circuit used. Spares and spaces shall be noted in pencil.

- .7 The nameplates for switchboards, distribution panels, power panels, etc. shall be Lamicoid with 13mm high letters with typical identification of e.g., "PP`AA, 600V 3 PH., 4W, fed from Switchboard `A'".
 - .8 The nameplates for panel boards shall be Lamicoid with 9.5mm high letters with typical identification of: e.g., "LP`B', 208V, 3Ph, 4W, fed from PP`A"
 - .9 Each breaker, switch, instrument, meter, etc. in switchboards, distribution panels, power panels, etc. shall have a Lamicoid nameplate with 6.4mm high letters with typical identification of: e.g., "Elevator #1" or "Pump-1A".
 - .10 The nameplates for disconnect switches, starters, time clocks, dimmers etc. shall be Lamicoid with 6.4mm high letters with typical identification of: e.g., "Supply Fan "S4", 5 HP, 600V, 3Ph., 3W, fed from `PP-1"
 - .11 Each feeder cable and feeder conduit shall be identified with 25mm high letters with typical identification of "208V, 3Ph, 4W to LP`B". The identification shall be provided at each access door, each change of direction, each junction box, at each floor or platform for vertically exposed conduits or cables at 2 metres above floor, at not more than 15 metres apart in straight runs, and on both sides of sleeves through walls.
 - .12 The interior, exterior and lids of all junction boxes and outlet boxes shall be neatly identified with different colours of paint. The colours shall be consistent throughout the project for the following systems:
 - .1 347/600 Volt System – Black
 - .2 120/208 Volt System – Blue
 - .3 120/208 Volt Lighting – Yellow
 - .4 120/208 Volt Emergency Lighting System – Orange
 - .5 Intrusion Detection System – Purple
 - .6 Computer System – Pink
 - .7 Fire Detection and Alarm System – Red
 - .8 Telephone System – Brown
 - .9 P.A./Telephone System – Green
 - .10 Cable TV – White (Co-ordinate with the Board)
 - .13 Provide all signs and marking of equipment as required by the Authorities having jurisdiction.
 - .14 Outlet boxes for light switch(es) and receptacle(s) and junction boxes provided for lighting or power connections shall be identified on the box cover with circuits contained in the box, the panels from which they are fed, the voltage and the purpose of the outlet.
 - .15 Each power switch and receptacle shall be complete with permanent printed adhesive label installed on faceplate, identifying panel and circuit from which it is fed.
- 1.40 MOCK-UP
- .1 A mock-up of the ceiling shall be provided by another Division of the Specification.
 - .2 Provide samples of the lighting fixtures, fire alarm devices and all other items of equipment mounted in or on the ceiling and obtain acceptance for the samples and their installation.
- 1.41 TEMPORARY AND TRIAL USAGE
- .1 When it is claimed that a portion of the work is completed and in accordance with the Drawings and Specifications, the Owner shall have the privilege of temporary and trial usage for a reasonable length of time for making a complete and thorough test of the portion of the work completed.

- .2 Temporary or trial usage by the Owner of any electrical device, machinery, apparatus, equipment or any other work or materials supplied under this Contract before final completion and written acceptance, is not to be construed as evidence of acceptance of same.

1.42 RECORD (AS-BUILT) DRAWINGS

- .1 Drawings for this project have been prepared on a CAD system using AutoCAD software of release version confirmed with consultant. For purpose of producing record "as built" drawings, copies of Contract Drawings can be obtained from consultant by paying \$3,500. Drawings may also to be used for preparation of layouts and interference drawings.
- .2 As work progresses at site, clearly mark in red in a neat and legible manner on a set of bound white prints of Contract Drawings, changes, and deviations from routing of services and locations of equipment shown on Contract Drawings, daily. Changes and deviations include those made by addenda, change orders, and site instructions. Use notes marked in red as required. Maintain white print red line as-built set at site for exclusive use of recording as-built conditions, keep always set up to date, and ensure set is always available for periodic review. As-built set is also to include the following:
 - .1 Dimensioned location of inaccessible concealed work.
 - .2 Locations of control devices with identification for each.
 - .3 Location of all pull boxes and junction boxes.
 - .4 Locate, with dimensions to the building grid and datum lines, all buried and concealed services, pull boxes, junction boxes, etc. for all systems.
 - .5 Location of all conduits, ducts, wiring, and conductor runs for all systems including sizes, types of components, circuit numbers, etc. exactly as installed.
 - .6 Location of concealed services terminated for future extension.
 - .7 Room names and numbering, equipment names, etc. shall be in accordance with the Owner's designation and may not necessarily be those shown on the drawings.
- .3 Before applying for a Certificate of Substantial Performance of the Work, update a clean copy of Contract Drawing set in accordance with marked up set of "as-built" white prints including deviations from original Contract Drawings, thus forming an "as-built" drawing set. Submit "as-built" site drawing prints to consultant for review. Make necessary revisions to drawings as per Consultant's comments, to satisfaction of consultant.
- .4 Reviews of the record drawings by the Consultant shall be for general conformance only and is not an approval of the accuracy of the drawings. Electrical Division shall be responsible for the accuracy of the record drawings.
- .5 Submit final reviewed "as-built" drawing set to consultant to produce final "as-built" CAD drawings for submission to the School Board.
- .6 Transfer all recorded information from marked-up set of As-Built condition to AutoCAD.
- .7 Unless otherwise noted in Divisions 00 or 01, failure to maintain accurate record drawings will incur additional 5% holdback on progress claims until drawings are brought up to date to satisfaction of consultant.

1.43 TESTING AND COMMISSIONING

- .1 All systems, equipment and installation shall be inspected, tested, adjusted, and commissioned to ensure compliance with the Drawings, Specifications and the Requirements of the Authorities having jurisdiction.
- .2 Provide testing equipment, instruments, material and labour for all testing and commissioning.
- .3 Submit reports of all testing and commissioning for review by the Consultants.

- .4 This Division shall include for the cost of one qualified serviceman, completely familiar with the project, complete with appropriate spare parts and tools, to become part of the commissioning team for the project. The serviceman shall assist the Owner for a total of 60 hours during the commissioning process. This work will be required at or near the substantial completion phase of the project. Each Division and/or trade providing serviceman shall ensure continuity of their function by having only one such person assigned to the commissioning team.
- .5 The actual performance of this work will be scheduled and coordinated by the Owner.

1.44 SYSTEM ACCEPTANCES

- .1 Prior to requesting final inspection, submit, for review by the Consultant, letters from the manufacturers of equipment and systems indicating that their Technical Service Representatives have inspected and tested the equipment and systems and are satisfied with the methods of installation, connections, and operation.
- .2 Acceptance letters shall be submitted for the following, when applicable:
 - .1 Switchboard
 - .2 Distribution Panels
 - .3 Power Panels
 - .4 Panel Boards
 - .5 Fire Detection and Alarm System
 - .6 Emergency Lighting System
 - .7 Intrusion Detection System
 - .8 Video Surveillance System
 - .9 Public Address System
 - .10 Lighting Control System

1.45 INSTRUCTIONS AND DEMONSTRATIONS

- .1 Instruct the Owner's designated personnel during construction and prior to requesting final inspection so that they are fully familiar with all aspects in the function, installation, operation and maintenance of all systems and equipment.
- .2 Arrange for and pay for the services of manufacturer's service technicians, engineers and other personnel required for instruction on specialized systems or installation.
- .3 After commissioning of the systems, equipment, and installation they shall be fully demonstrated by this Division and representatives of the manufacturers to the Authorities having jurisdiction.
- .4 Prior to requesting final inspection submit, for each system, the following:
 - .1 Dates and durations of instructions given to designated personnel and the names of persons instructed.
 - .2 Signature of each person instructed stating that they understand and are familiar with the function, installation, operation, and maintenance of the system.
 - .3 Dates and durations of demonstrations to Authorities having jurisdiction and names of all persons present.

1.46 OPERATING AND MAINTENANCE INSTRUCTION MANUALS

- .1 Supply one hard copy of operating and maintenance (O&M) manuals consolidated in hardcover three "D" ring binders with each binder sized to include approximately 25% spare space for future data. Confirm exact quantity of manuals with consultant. Each binder to include:
 - .1 On front cover: project name; wording – "Electrical Systems Operating and Maintenance Manual"; and date.
 - .2 Introduction sheet listing Consultant, Contractor, and Subcontractor names, street addresses, telephone and fax numbers, and e-mail addresses.

- .3 Equipment manufacturer's authorized contact person name, telephone number and company website.
 - .4 Table of Contents sheet, and corresponding Index tab sheets for all electrical specification sections.
 - .5 Copy of each "Reviewed" or clean, updated "Reviewed As Noted" shop drawing or product data sheet, with manufacturer's/supplier's name, telephone and fax numbers, email address, company website address, and email address for local source of parts and service; when shop drawings are returned marked "REVIEWED AS NOTED" with revisions marked on shop drawing copies, they are to be revised by equipment supplier to incorporate comments marked on "reviewed" shop drawings and a clean updated copy is to be included in operating and maintenance manuals;
 - .6 Testing and commissioning reports, and certificates issued by governing authorities.
 - .7 Operating data is to include:
 - .1 Demonstration and instruction certificate.
 - .2 Description of each system and its controls.
 - .3 Control schematics for equipment/systems.
 - .4 Description of operation of each system.
 - .5 Operation instruction for each system and each component.
 - .6 Description of actions to be taken in event of emergencies and/or equipment failure.
 - .7 Testing procedures.
 - .8 Trouble finding procedure.
 - .8 Maintenance data is to include:
 - .1 Servicing maintenance, operation, and trouble-shooting instructions for each item of equipment and each system.
 - .2 Schedules of tasks, frequency, tools required, and estimated task time.
 - .3 Complete spare parts lists with numbers.
 - .4 Catalogue sheets for all components.
 - .5 Approved shop drawings.
 - .6 Wiring diagram.
 - .9 Copies of warranties.
 - .10 Items requested specifically in Section Articles.
- .2 Operating and maintenance instructions are to relate to job specific equipment supplied under this project and related to Owner's building. Language used in manuals is to contain simple practical operating terms and language easy for in-house maintenance staff to understand how to operate and maintain each system.
 - .3 Before applying for a Certificate of Substantial Performance of the Work, assemble one copy of O&M Manual and submit to consultant for review prior to assembling remaining copies. Incorporate Consultant's comments into final submission.
 - .4 Provide 1 digital copies of contents of operating and maintenance manuals and load onto separate USB type flash drives and submit to consultant. Prepare digital copies using version of Adobe Acrobat Portable Document Format or equal as confirmed with consultant and enhanced with bookmarks and internal document links. Each PDF file name shall be the same as that indicated in the binder. The contents in each PDF file shall be searchable.
- 1.47 COMMISSIONING
- .1 A commissioning Authority will be appointed by the Board/Owner to oversee the commissioning activities of the electrical contract. Cooperate and coordinate with the Authority. Perform all commissioning activities for all aspects of work provided in Electrical Divisions. Perform all corrective work identified by the Authority.

- .2 Comply with the requirements of sections 20 05 40 and 25 05 15, prepared by Commissioning consultant.

1.48 WARRANTY

- .1 Unless otherwise specified in Divisions 00 and 01, warrant electrical work to be in accordance with Contract Documents and free from defects for a period of one (1) year from date of issue of a Certificate of Substantial Performance of the Work.
- .2 Where equipment includes extended warranty period, e.g., five (5) years, first year of warranty period is to be governed by terms and conditions of warranty in Contract Documents, and remaining years of warranty are to be direct from equipment manufacturer and/or supplier to Owner.
- .3 Warranty to include parts, labour, travel costs and living expenses incurred by manufacturer's authorized technician to provide factory authorized on-site service.
- .4 Repair and/or replace any defects that appear in Work within warranty period without additional expense to Owner. Be responsible for costs incurred in making defective work good, including repair or replacement of building finishes, other materials, and damage to other equipment. Ordinary wear and tear and damage caused wilfully or due to carelessness of Owner's staff or agents is exempted.
- .5 Do not include Owner deductible amounts in warranties.
- .6 It is understood that warranties are to commence from time of Substantial Performance of the Work, regardless of what is noted within following Sections of Specification. Be responsible for providing whatever "bridging" or additional extended warranty period is required from time that material is purchased until this time.
- .7 Submit signed and dated copies of extended warranties to consultant which clearly states herein specified requirements.
- .8 Visit building during warranty period with Owner representatives. Owner to organize these visits. At these meetings, Owner representatives are to review performance of systems. If performance is satisfactory, then no further action needs to be taken. If unsatisfactory, then correct deficiencies, as directed by Owner representatives, to satisfaction of Owner's representatives. These site visits to occur:
 - .1 once during first month of building operation.
 - .2 once during third month of building operation.
 - .3 once between fourth and tenth month in a season opposite to first- and third-month visits.
- .9 The following table indicates the warranty period that shall be provided for the following equipment:

EQUIPMENT	ITEMS	WARRANTY
LIGHTING	All types of lighting fixtures including LED lamps, drivers, and other associated components.	5 YEARS
LIGHTING CONTROLS	Lighting controls components including occupancy sensors, power packs, dimming switches, room controllers, control	5 YEARS

EQUIPMENT	ITEMS	WARRANTY
	wiring and other associated components	
DISTRIBUTION	Electrical distribution including switchboard, power panels, panel boards, contactors, transformers, relays, cables, wiring etc.	1 YEAR
FIRE ALARM SYSTEM	Fire alarm system complete with all components, devices etc.	1 YEAR

- .10 The Owner/Board reserves the right to initiate a service contract for all equipment with one of the boards approved certified service companies. This shall not affect any of the above extended warranties provided by the manufacturers.

1.49 EQUIPMENT AND SYSTEM MANUFACTURER'S CERTIFICATION

- .1 When equipment/system installation is complete, but prior to start-up procedures, arrange and pay for equipment/system manufacturer's authorized representative to visit site to examine installation, and after any required corrective measures have been made, to certify in writing to consultant that equipment/system installation is complete and in accordance with equipment/system manufacturer's instructions.

1.50 EQUIPMENT AND SYSTEM START-UP

- .1 When installation of equipment/systems is complete but prior to commissioning, perform start-up for equipment/systems as specified in electrical work Sections in accordance with following requirements:
 - .1 Submit a copy of each equipment/system manufacturer's start-up and verification report sheet to consultant for review and incorporate any comments.
 - .2 Under direct on-site supervision and involvement of equipment/system manufacturer's representative, start-up equipment/systems, make any required adjustments, document procedures, leave equipment/systems in proper operating condition, and submit a complete set of start-up and verification documentation sheets signed by manufacturer/supplier and Contractor, to consultant.

1.51 PROJECT CLOSEOUT SUBMITTALS

- .1 Prior to application for Substantial Performance of the Work, submit required items and documentation specified, including following:
 - .1 Operating and Maintenance Manuals.
 - .2 As-built record drawings and associated data.
 - .3 Extended warranties for equipment as specified.
 - .4 Operating test certificates, i.e., Fire alarm verification Certificate.
 - .5 Final commissioning report.
 - .6 Identified keys for equipment and/or panels for which keys are required, and other items required to be submitted.
 - .7 Other data or products specified.

1.52 INSTRUCTIONS TO OWNER

- .1 Refer to equipment and system operational and maintenance training requirements specified in Division 01.

- .2 Train Owner's designated personnel in aspects of operation and maintenance of equipment and systems as specified. Demonstrations and training are to be performed by qualified technicians employed by equipment/system manufacturer/supplier. Supply hard copies of training materials to each attendee.
- .3 Unless where specified otherwise in trade Sections, minimum requirements are for manufacturer/suppliers of each system and major equipment, to provide minimum two separate sessions each consisting of minimum 4 hours on site or in factory training (at Owner's choice), of Owner's designated personnel (for up to 6 people each session), on operation and maintenance procedures of system.
- .4 For each item of equipment and for each system for which training is specified, prepare training modules as specified below. Use Operating and Maintenance Manuals during training sessions. Training modules include but are not limited to:
 - .1 Operational Requirements and Criteria – equipment function, stopping and starting, safeties, operating standards, operating characteristics, performance curves, and limitations.
 - .2 Troubleshooting – diagnostic instructions, test, and inspection procedures.
 - .3 Documentation – equipment/system warranties, and manufacturer's/supplier's parts and service facilities, telephone numbers, email addresses, and the like.
 - .4 Maintenance – inspection instructions, types of cleaning agents to be used as well as cleaning methods, preventive maintenance procedures, and use of any special tools.
 - .5 Repairs – diagnostic instructions, disassembly, component removal and repair instructions, instructions for identifying parts and components, and review of any spare parts inventory.
 - .6 The training sessions shall be scheduled and co-ordinated by the Commissioning Agent. The Commissioning Consultant shall video tape the sessions. Refer to Section 20 05 40 for further requirements.
- .5 Before instructing Owner's designated personnel, submit to consultant for review a preliminary copy of training manual and a proposed schedule of demonstration and training dates and times. Incorporate Consultant's comments in final copy.
- .6 Obtain in writing from consultant a list of Owner's representatives to receive instructions. Submit to Consultant prior to application for a Certificate of Substantial Performance of the Work, a complete list of systems for which instructions were given, stating for each system:
 - .1 Date instructions were given to Owner's staff.
 - .2 Duration of instruction.
 - .3 Names of persons instructed.
 - .4 Other parties present (manufacturer's representative, consultants, etc.).
- .7 Obtain signatures of Owner's staff to verify they properly understood system installation, operation, and maintenance requirements, and have received operating and maintenance instruction manuals and "as-built" record drawings.
- .8 Submit to Consultant, copy of electronic version of training materials used to train Owner's designated personnel. Include in operating and maintenance manuals submission.

1.53 FINAL INSPECTION

- .1 Submit to Consultant, written request for final inspection of systems. Include written certification that:
 - .1 Deficiencies noted during job inspections have been completed.
 - .2 Field quality control procedures have been completed.
 - .3 Systems have been tested and verified, adjusted, and are ready for operation.
 - .4 Maintenance and operating data have been completed and submitted to, reviewed, and accepted by consultant.

- .5 Tags and nameplates are in place and equipment identifications have been completed.
- .6 Clean-up is complete.
- .7 Spare parts and replacement parts specified have been provided and acknowledged by consultant.
- .8 As built and record drawings have been completed and submitted to, reviewed, and accepted by consultant.
- .9 Owner's staff has been instructed in operation and maintenance of systems.
- .10 Commissioning procedures have been completed.

1.54 SUB-CONTRACTORS TO THE ELECTRICAL CONTRACTOR

- .1 The Electrical Contractor agrees to employ those sub-contractors proposed in the Electrical Form(s) of Tender and accepted by the Board/Owner at the signing of the Contract with the General Contractor.
 - .1 The Board/Owner may, for reasonable cause object to the use of a proposed Sub-Contractor and consequently, may require the Electrical Contractor to employ one of the other Sub-Contractors or Bidders.
- .2 If the Board/Owner requires a change from a proposed Sub-Contractor originally proposed by the Electrical Contractor, the Contract Price shall be adjusted by the difference in cost.
- .3 The Electrical Contractor shall not be required to employ as a Sub-Contractor, a firm to whom he may reasonably object.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-C22.2 No. 131, Type TECK 90 Cable.
 - .2 CSA-C22.2 No. 51 (latest edition), Armoured Cables.
 - .3 CSA C22.2 No. 38 (latest edition), Thermoset-Insulated Wires and Cables.
 - .4 CSA C22.2 No. 75 (latest edition), Thermoplastic-Insulated Wires and Cables.
 - .5 CSA C22.2 No .0.3 (latest edition), Test Methods for Electrical Wires and Cables.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Low voltage wires and cables up to 4/0 shall, unless otherwise noted, have copper conductors with T90 Nylon, 600-volt insulation.
- .3 Low Voltages wires and cables 250 MCM and larger shall, unless otherwise noted, have copper conductors with RW90 X-Link minus 40 degrees F, 1000-volt insulation.
- .4 Aluminium sheathed feeder cables shall, unless otherwise noted, have a corrugated seamless aluminium sheath, copper conductors, RA90 X-Link minus 40 degrees F, 1000-volt insulation and without P.V.C. jacket.
- .5 M.I.C.C. cables shall have solid copper conductors insulated with magnesium oxide and enclosed in a seamless copper sheath with a protective jacket where required.
- .6 All outdoor and underground wiring shall have copper conductors with RWU-90, X-Link, minus 40 degrees F, 1000-volt insulation.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 Wires and cables shall be selected so that their current carrying capacity conforms to the standards of the Authorities having jurisdiction.
- .3 Feeders and branch circuits shall be as indicated on the drawings. Supporting of wires and cables with tie wires, perforated straps, etc., shall not be permitted. Electrical Contractor shall use approved clips.
- .4 Unless otherwise indicated on the drawings no wire smaller than #12 AWG shall be used except for internal wiring of lighting fixtures which can be #14.
- .5 BX90 aluminium sheathed cable, unless otherwise noted, may be used in accessible ceiling space and where concealed only. Install BX cables with anti-short bushings.

- .6 Aluminium sheathed and M.I.C.C. cables shall be installed with horizontal supports at not more than 1220mm intervals and shall be spaced, bonded, and grounded in accordance with the requirements of the Authorities having jurisdiction.
- .7 Aluminium sheathed and M.I.C.C. cables shall be terminated with moisture proof connectors.
- .8 Where single conductor cables enter a ferrous box, provide the required non-ferrous plates. Slotting between the knockouts shall not be accepted.
- .9 Aluminium sheathed and M.I.C.C. cables shall be suitably protected, when installed within 5 feet of the floor and in all locations where they might be subject to mechanical injury.
- .10 Joints in feeder cables shall not be permitted.
- .11 Joints in branch circuit wiring shall only occur where such circuits divide at a junction box and shall be mechanically and electrically sound and shall be securely fastened by means of "Ideal" 600V special service wire nut connectors.
- .12 Conductors shall be colour coded and the colour coding shall be consistent throughout the project.
- .13 Conductors shall be identified with self-sticking wire markers, indicating circuit number at all terminations and joints, at panels, pull boxes, junction boxes, etc.
- .14 Termination lugs for feeder cables shall be compression type.
- .15 All outdoor and underground wiring shall have copper conductors with RWU-90, X-Link, minus 40 degrees F, 1000-volt insulation.
- .16 Wiring terminated in an outlet box for future lighting or power shall have 250mm of slack and each cable shall be terminated in a connector.
- .17 Exposed cable runs shall be installed parallel to, or horizontally on, the walls of the building.
- .18 Loads shall be circuited to provide fully balanced feeders.
- .19 Only lubricants approved by the Authorities having jurisdiction shall be used and they shall be suitable for the type of cables installed.

END OF SECTION

1.1 GENERAL

1.2 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 OESC – Latest Edition.
 - .2 Electrical Safety Authority – Latest Inspection Bulletins.
 - .3 CSA C22.1, Canadian Electrical Code, Part 1 – Latest Edition.
 - .4 CAN/CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities, where applicable.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 The grounding equipment shall be in accordance with CSA C22.2 and the copper grounding conductors in accordance with ASA G7.1.
- .3 Provide non corroding accessories necessary for the grounding system.
- .4 Building ground system to consist of a grid of copper welded ground rods (minimum 4' to 10' (1.2m to 3m) long spaced minimum of 10' (3m) apart, interconnected with bare minimum No. 3/0 AWG copper loop. Ground rods shall be driven sufficiently to contact permanent water table. Provide minimum No. 3/0 AWG copper ground loop inside electrical room and vaults for grounding of equipment enclosures and connect to ground grid. Connect building water service pipes (both street and building sides), gas service pipes and sprinkler system pipes, supply and return hot water heating pipes to ground system with minimum No. 3/0 AWG copper ground conductor in conduit. Perform resistivity test on soil to determine exact quantity of rods (minimum of 4).
- .5 All buried ground connections shall be Thermit welded type.
- .6 Provide one (1) No. 3/0 AWG insulated green copper ground conductor in conduit from the main building ground to the main Telephone/LAN Room. Provide a minimum 24" (600mm) long x 2" (50mm) high x 3/8" (10mm) thick copper ground bus and install on wall with standoff isolators and connect to 3/0 cable. Ground bus to have eight drilled taps. Provide one (1) #6 AWG green ground conductor in conduit from this ground bus and extend to each satellite LAN Room and coil for future connection to computer cable termination rack.
- .7 Where cable trays are used for the data cabling pathways, ensure that they are grounded and bonded in accordance with the Ontario Electrical Safety Code.
- .8 Continuous rows of fluorescent/LED fixtures shall be equipped with No. 12 bare copper ground wire for the full length of fixture row.
- .9 The accessories shall be as manufactured by Burndy, Erico, Amp or Caldwell.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 Provide complete permanent and continuous, system and equipment grounding systems including, ground rods, conductors, connectors, accessories, to conform to requirements of the Authorities having jurisdiction.
- .3 Install connectors to manufacturer's instructions.
- .4 Protect exposed grounding conductors from mechanical injury.
- .5 All non-current carrying metal parts shall be bonded in accordance with ESA, CSA, and provincial inspection department standards.
- .6 The neutrals of the dry-type transformer shall be connected by a separate copper ground wire to the ground bus in the switchboard.
- .7 A separate copper ground wire to the ground bus in the switchboard shall be provided for each isolation transformer and isolated ground lighting panel.
- .8 Separate copper wire shall be installed in all flexible conduits, in all rigid conduits, in wall or below slab conduits, EMT conduits and all non-metallic conduits.
- .9 Connect the ground bus in the main switchboard to the main ground and incoming water main ahead of the water meter and provide a water meter shunt.
- .10 The grounding system in the main switchboard shall be suitable for use with the ground fault system.
- .11 Install separate grounding/bonding systems for telephone system, fire detection and alarm system, public address system, video surveillance system and intrusion detection system, in accordance with the systems suppliers' requirements.
- .12 Install grounding system for pad mounted transformer in accordance with ESA and Local Hydro requirements.
- .13 All grounding conductors run inside of building, except in electrical and LAN rooms, shall be run in EMT conduit.
- .14 Install separate ground conductor for outdoor lighting standards.
- .15 Install grounding connections to typical equipment included in, but not necessarily limited to following list: Service equipment, transformers, switchgear, duct systems, motor frames, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting etc.
- .16 Install electrode interconnections where metal parts, circuits, or grounding conductors and/or electrodes are in proximity to lightning rod conductors.
- .17 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Owner's Representative and local authority having jurisdiction over installation.

END OF SECTION

1. General
 - 1.1 APPLICATION
 - .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
 - .2 Refer to section 26 05 01, Electrical Work General Instructions.
 - 1.2 SUBMITTALS
 - .1 Submit shop drawings for all products specified in Part 2.
2. Products
 - .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
 - .2 Type 'C', 'D', 'T' and 'E' pull boxes, junction boxes and cabinets shall be made of code gauge steel with corners lapped and welded and shall be painted and identified as noted in this specification.
 - .3 Cabinets shall provide proper space for conduits, wires and connections and their size shall be in accordance with the requirements of the Authorities having jurisdiction.
 - .4 The trim and cover shall be as required by the service and location.
 - .5 Splitters shall be sheet metal enclosure complete with welded corners and formed hinged cover suitable for locking in closed position.
 - .6 Splitters main and branch lugs/connection bars shall match the required size and number of incoming and outgoing conductors as indicated on drawings.
 - .7 At least three spare terminals shall be provided on each set of lugs in splitters less than 400A.
 - .8 The metal cabinets shall be as manufactured by Eaton, Square-D, Siemens, or Hammond.
3. Execution
 - .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
 - .2 Pull boxes, junction boxes and cabinets shall be independently supported from the conduit connected to them.
 - .3 Pull boxes shall be installed in inconspicuous but accessible locations.
 - .4 The cabinets shall be suitable for the installation and location.
 - .5 Cabinets shall be mounted with top not higher than 2m above finished floor.
 - .6 All electrical pull boxes above drywall ceilings shall be accessible via a properly sized access door installed directly below the respective pull box in drywall ceilings. Temporary removal of electrical light fixtures will not be considered safe access to above ceiling electrical boxes and shall not be permitted and acceptable.
 - .7 Install splitters and mount plumb, true and square to the building lines.

- .8 All pull boxes, cabinets, equipment shall be identified in accordance with Section 26 05 01, Electrical Work General Instructions.
- .9 Identification labels shall be provided indicating system name voltage and phase.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1.
 - .2 OESC – Latest Edition.
 - .3 Electrical Safety Authority – Latest Inspection Bulletins.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Size boxes in accordance with latest edition of OESC and/or CSA C22.1.
- .3 102 mm square or larger outlet boxes shall be provided as required for special devices.
- .4 Blank cover plates shall be provided for all outlet boxes without wiring devices.
- .5 347 V outlet boxes shall be provided for 347 V switching devices.
- .6 Barriers shall be provided for outlet boxes where more than one system are grouped.
- .7 Outlet boxes used with rigid steel conduit shall be 'FS' or 'FD' Feraloy condulets.
- .8 Outlet boxes used with EMT conduit shall be electro-galvanized and made of code gauge steel except when they are surface mounted on walls and then they shall be 'FS' or 'FD' Feraloy condulets.
- .9 Outlet boxes installed outside the building shall be weatherproof type, with neoprene gasket and cast cover.
- .10 Electro-galvanized steel masonry single and multi-gang boxes shall be provided for devices flush mounted in exposed block walls.
- .11 Electro-galvanized sheet steel concrete type boxes shall be provided for flush mount in concrete with matching extension and plaster rings as required.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 All outlet boxes shall be supported independently of connecting conduits.
- .3 Outlet boxes shall have adequate knockouts, but only those knockouts actually required shall be opened.

- .4 Outlet boxes shall be securely fastened to the surface on which they are mounted. If the boxes are not mounted on a surface, then adequate and independent supports must be provided.
- .5 Outlet boxes shall be provided for each surface mounted lighting fixture.
- .6 Outlet boxes shall be provided for each recessed mounted lighting fixture.
- .7 Multi-gang outlet boxes with single cover plate shall be used where switches are grouped.
- .8 Unused opened knockouts shall be closed with steel knockout plugs.
- .9 Correct size of openings shall be provided in boxes for conduit, mineral insulated and armoured cable connections. Installation of reducing washers will not be acceptable and allowed.
- .10 All electrical outlet boxes above drywall ceilings shall be accessible via a properly sized access door installed directly below the box in drywall ceilings. Temporary removal of electrical light fixtures will not be considered safe access to above ceiling electrical boxes and shall not be permitted and acceptable.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 45, Rigid Metal Conduit.
 - .2 CSA C22.2 No. 83, Electrical Metallic Tubing.
 - .3 CSA C22.2 No. 211.2, Rigid PVC (Un-plasticized) Conduit.
 - .4 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .5 CAN/CSA C22.2 No. 227.3, Flexible PVC conduit. Non-metallic Mechanical Protection Tubing (NMPT), a National Standard of Canada.

1.3 SUBMITTALS

- .1 Submit shop drawings for all products specified in Part 2.
- .2 Submit the following to the Consultant for review:
 - .1 Location drawings for all required sleeves and formed openings in poured concrete or precast concrete construction.
 - .2 Samples of materials and any other items as specified in succeeding Sections of this Division of the Specification.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Rigid metal conduits shall be electro-galvanized and made of standard weight steel pipe and connected with electro-galvanized threaded couplings.
- .3 Electrical metallic tubing shall be a metal raceway which has a wall thinner than that of rigid metal conduit and an outside diameter sufficiently different from that of rigid metal conduit to render it impracticable for anyone to thread it with a standard pipe thread.
- .4 Rigid PVC conduits shall be a rigid non-metallic conduit of un-plasticized polyvinyl chloride.
- .5 Rigid Type I shall be similar to rigid PVC duct, Type EB1, to CSA Standard B196.1 requiring encasement in concrete.
- .6 Rigid Type II shall be similar to Type I except of heavier construction and suitable for direct burial.
- .7 Flexible conduits shall be liquid-tight flexible metal conduit.
- .8 Rigid metal conduits entering boxes in dry locations shall be secured with galvanized steel locknuts and nylon insulated steel bushings.
- .9 Rigid metal conduits entering boxes in wet locations shall be secured with steel bullet hub connectors, nylon insulated with neoprene 'O' ring.

- .10 Connectors for EMT surface mounted conduit shall be steel, set screw and nylon insulated.
 - .11 Connectors for EMT conduit in concrete shall be steel, raintight, concrete tight and nylon insulated.
 - .12 Couplings for EMT conduit surface mounted shall be steel set screw type.
 - .13 Couplings for EMT conduit in concrete shall be steel, rain tight and concrete tight.
 - .14 Connectors for flexible conduit shall be steel, liquid-tight, nylon insulated with neoprene 'O' ring.
3. Execution
- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
 - .2 Install all conduit, conduit fittings and accessories in accordance with the latest edition of the Canadian Electrical Code in a manner that does not alter, change, or violate any part of the installed system components or the CSA/UL certification of these components.
 - .3 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
 - .4 Raceways shall be as shown on the Drawings and as detailed in the Specification.
 - .5 The size of conduit shall be in accordance with the requirements of the Authorities having jurisdiction.
 - .6 All conduits inside the building shall, unless otherwise noted, be electrical metallic tubing.
 - .7 Unless otherwise noted branch circuit conduits shall be concealed in wall and ceilings or exposed in unfinished areas and shall not be installed below or in any concrete slab unless otherwise approved by the owner/consultant. Where it is noted that branch circuit conduits can be installed in a concrete slab that is not on grade the conduit shall be electrical metallic tubing with a copper ground wire.
 - .8 Conduits exposed to the weather, in wet locations, subject to mechanical injury or in any hazardous locations, shall be rigid metal conduit.
 - .9 Conduits in plenums shall be rigid metal conduit.
 - .10 Telephone zone conduits shall be PVC conduit when installed in concrete and EMT in other locations.
 - .11 Telephone distribution conduits shall be rigid P.V.C. conduit when installed in concrete or underground and EMT conduit in other locations.
 - .12 Motor feeder drops shall be in rigid conduit with a maximum 910mm of flexible metal conduit. Rigid conduit for the drops shall start at least 910mm ahead of the actual bend and have two additional clips over normal requirements. The minimum conduit size for the drops shall be 19mm.
 - .13 Liquid tight flexible metal conduit shall be used for connection to motors or vibrating equipment in damp, wet or corrosive locations.
 - .14 Explosion proof flexible connection shall be used for connection to explosion proof motors.
 - .15 Conduit sealing fittings shall be installed complete with compound in hazardous areas.

- .16 Conduits in finished areas shall be concealed and those in unfinished areas shall be surface mounted unless otherwise noted.
- .17 Feeder conduits shall not be installed in or below any concrete slab, unless approved by the Consultant.
- .18 Conduits shall be installed so that the conductors can be drawn in without strain or injury.
- .19 Expansion fittings shall be installed in conduits crossing expansion joints.
- .20 Conduits shall be installed to provide for expansion and expansion fittings shall be provided where required.
- .21 Conduits shall not be installed within 75mm of water, sprinkler, drain or waste piping.
- .22 Exposed conduits shall run parallel to or horizontally on the walls of the building.
- .23 Conduit ends shall be carefully plugged during construction with steel capped bushings.
- .24 The use of running threads shall not be permitted. Ericson couplings shall be used where required.
- .25 Conduits shall not pass-through structural members without the approval of the Consultants.
- .26 Powder activated fastenings can only be used if approved by the Consultant.
- .27 Conduits shall be fastened with approved clips. Supporting of conduits with tie wires, perforated straps, etc. shall not be permitted. If a conduit rests on structural steel, etc., this will not be considered as a support. Provide proper supports, hangers, etc. and supports conduits from the top of structural beams/joists.
- .28 Conduits shall not be attached or suspended from the metal deck unless approved by the Consultant.
- .29 Conduit supports shall be spaced in accordance with the requirements of the Authorities having jurisdiction.
- .30 An adequate number and size of pull boxes shall be installed where required in all conduits runs to facilitate the installation of the conductors.
- .31 Fish wires shall be installed in all empty conduits, including telephone conduits.
- .32 Excessive lengths of flexible conduit shall not be accepted. Maximum 10'-0" of length will be acceptable.
- .33 Proper metallic contacts shall be made between conduit, boxes, etc.
- .34 Maximum size of conduit on which ground bushings can be used is 32mm.
- .35 A separate ground wire shall be installed in all flexible conduits, EMT conduits, underground conduits, in wall or below a concrete slab, underground parking lot lighting and in all non-metallic conduits or ducts.
- .36 Installation of conduit in oversize knockouts shall not be accepted.
- .37 Joints in conduits installed underground, in concrete slab on grade or in a concrete duct bank shall be pitched on the outside and made completely watertight.
- .38 Minimum concrete thickness over a conduit in a concrete slab where applicable shall be 50mm.

- .39 Spare or unused conduits that terminate in an enclosure shall be capped.
- .40 Conduits passing through concrete and/or masonry floors, walls, roof and any other such construction shall be provided with sleeves.
- .41 Electrical conduit roof flashing shall be similar to National Roofing supply product code# ECP-PVCH (electrical conduit post PVCH), Gooseneck S.S.A ARPGN2 (2")/ ARPGN3 (3").
- .42 Protect conduits from damage where they stub out of concrete. Use rigid steel conduit for stub-up and adapt to in floor rigid PVC conduit.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Access panels for walls and ceiling shall be of the flush type with concealed flanges constructed from 12 gauge minimum bonderized steel and shall be complete with anchor straps, rust resistant concealed hinges and positive locking, self-opening screwdriver operated lock. Coordinate with Division 23.
- .3 Access panels in tiled walls shall be stainless steel with recessed door panel to accept wall finish and shall be of a size to suit tile pattern.
- .4 Access panels installed in fire rated walls, partitions or ceilings shall have a fire resistance rating equal to the materials in which they are installed.
- .5 Access panels shall be as manufactured by LeHage, SMS, Pedlar or approved equal.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 All parts of the installation including, but not limited to, pull-in, junction and outlet boxes, cabinets, gutters, etc. shall be accessible.
- .3 Supply access panels as required to provide complete access to all equipment and connections. The access panels shall be installed by other Sections of the specification.
- .4 Provide drawings showing size, type and location of all access panels and submit for review by the Consultant.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Electric supplementary heaters and controls shall, unless otherwise noted, be supplied by Division 23.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 Install all electric heaters and remote electric thermostats supplied by Division 23.
- .3 Electric duct heaters shall be installed by another Division of Specification.
- .4 Provide all conduit, wiring, etc. and connect to the electric heaters, electric duct heaters and remote electric thermostats to provide a complete Electric Heating System.
- .5 Install filler pieces as shown on the drawings between baseboard heaters to form a continuous length.
- .6 All L.V. control wiring shall be by Division 23.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 The pipe tracing cables, and controls shall, unless otherwise noted, be provided by Division 23.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 Provide all conduit, wiring, pipe tracing cables, etc., and connect to the pipe tracing cables and controls to provide a complete pipe tracing system.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 This Section is for provisions for Building Automation System only.
- .3 Divisions 23 will supply and install a Computerized Building Automation System complete with the distribution boxes, control sequencing and all interfacing.
- .4 Division 26 shall provide individual lighting relays and/or contactors for each individual circuit and associated relay boxes and connect to load side of relays, as shown on the drawings. All control wiring by Division 23.
- .5 Contactors used in conjunction with building automation system shall be electrically operated, electrically held type. Refer to Section 26 29 01.
- .6 Coordinate all work with Division 23.

Execution: NOT USED

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No. 47, Air Cooled Transformer (Dry Type).
 - .2 CSA C9, Dry Type Transformers.
 - .3 National Electrical Manufacturers Association (NEMA).

1.3 SUBMITTALS

- .1 Submit shop drawings for all products specified in Part 2.
- .2 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Dry type transformers shall, unless otherwise noted, be of the indoor air-cooled dry type of the size, rating and capacities as shown on the drawings and shall be sprinkler-proof.
- .3 Transformers shall be of the 1.2 KV Class 10 KV B.I.L. 220°C insulation, copper wire, temperature rise above a maximum ambient temperature of 150 degrees C.
- .4 Transformers shall have 4 - 2½% full capacity taps, 2 above and 2 below normal.
- .5 Ample ventilation openings at top, bottom, front, and sides shall be provided but these shall be shielded to prevent access to the live parts.
- .6 Transformers shall be equipped as required with eye bolts, braces, etc. to enable them to be wall mounted, floor mounted or suspended. Units shall be braced to block walls to suit seismic requirements.
- .7 External anti-vibration isolation mountings shall be supplied and installed for all transformers.
- .8 Transformers shall have two coats of primer and two finish coats of ASA 61 grey paint.
- .9 Transformer nominal efficiency of different KVA ratings must follow ASHRAE Standard 90.1-2010. Transformers shall be Harmonic Mitigator and similar to Powersmiths Model T1000-C3, Delta Mitigator e-silver, Marcus Supreme, or approved equal by the Consultant.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.

- .2 Locate the dry type transformers where shown on the drawings and ensure that there is adequate ventilation so that they operate as specified and that there is no transfer of heat to adjacent surfaces or equipment.
- .3 Prior to energizing or commissioning any transformer it shall be fully inspected, tested, checked, and adjusted to include, but not limited to the following:
 - .1 Grounding.
 - .2 Ratio.
 - .3 Polarity.
 - .4 Insulation resistance.
 - .5 Taps adjusted to give rated voltage specified at rated capacity.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 29, Panel boards and enclosed Panel boards.

1.3 SUBMITTALS

- .1 Submit shop drawings for all products specified in Part 2.
- .2 Drawings to include electrical detail of panel board, branch breaker type, quantity, ampacity, KAIC rating and enclosure dimensions etc.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Panel boards shall be of the size, capacity and type as shown on the drawings. Series or integrated ratings shall not be an acceptable method of achieving specified interrupting levels for breakers, panels, or electrical equipment in general. Where an interrupting rating is specified, it shall be on a breaker, panel, or switchboard. Each breaker associated shall be fully rated to interrupt that magnitude of current. If there is a conflict between drawings and specifications, the higher rated value associated with that particular equipment shall be deemed to be correct.
- .3 Panel boards shall be of the sprinkler-proof, dead front type enclosed in code gauge steel equipped with door, gasket, lock, and directory and shall be suitable for surface or flush mounting as required.
- .4 Bussing in each panel shall be copper and shall extend the full length of the panel. Multi-section panels shall have full capacity rated horizontal bussing between each section.
- .5 Breakers shall be ambient compensated type, calibrated at 40 degrees C and be of the bolt-on type. Multi-pole breakers shall have common trip.
- .6 Panel boards for use on 240-volt or 208-volt system shall, unless otherwise noted be of the "NQ" panel or I-line panel as indicated on drawings.
- .7 Panel boards for use on 600-volt system shall, unless otherwise noted be of the "NF" panel as indicated on drawings.
- .8 Panels, including tubs, shall have two coats of primer paint and two coats of ASA 61 grey paint.
- .9 Panel boards shall be of the same manufacturer as the switchboard.
- .10 All circuit breakers shall be installed in panel boards before shipment.
- .11 Panel boards shall be provided with mains, number of circuits, KAIC rating and branch circuit breaker sizes as indicated in contract documents.

- .12 Lock-on devices shall be provided for fire alarm, emergency and exit lighting circuits and other circuits as indicated in contract documents.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 Locate panel boards where indicated; and mount securely and plumb true and square to adjoining surfaces.
- .3 Panels are to be mounted so that the top of the panels are 1800mm above finished floor.
- .4 Provide 2 - 32mm empty conduits from each flush mounted panel to the ceiling spaces above and below for future installation.
- .5 Provide wire-ways above multi-section panels to avoid cross-wiring.
- .6 Numbering of breakers in multi-panel assemblies shall be consecutive. If necessary, provide narrow Dymomite strips with the required numberings.
- .7 Prior to energizing or commissioning the panels, they shall be fully inspected, tested, checked, and adjusted to include, but not limited to, the following:
 - .1 Grounding.
 - .2 Breaker settings.
 - .3 Breaker operation.
 - .4 Continuity of feeder cables.
 - .5 Phase resistance of feeder cables.
 - .6 Insulation resistance of feeder cables.
 - .7 Proper phasing of incoming and feeder cables.
 - .8 Equal division of load between parallel conductors.
 - .9 Bus torque, supports, clearance, general mechanical conditions, and insulation resistance.
- .8 30% of all breakers in panels shall be equipped with locking devices. These locking devices shall be installed as directed by the Consultant on completion of work and the unused units shall be handed over to the Owners.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 29, Panel boards and enclosed Panel boards.

1.3 SUBMITTALS

- .1 Submit shop drawings for all products specified in Part 2.
- .2 Drawings to include electrical detail of power panel, branch breaker type, quantity, ampacity, KAIC rating and enclosure dimensions etc.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Power panels shall be factory assembled, sprinkler proof, free standing, dead front type, complete with door and gasket suitable for use on the system as specified on the drawings.
- .3 Power panels shall be of the size, capacity and type as shown on the drawings. Series or integrated ratings shall not be an acceptable method of achieving specified interrupting levels for breakers, panels, or electrical equipment in general. Where an interrupting rating is specified, it shall be on a breaker, panel, or switchboard. Each breaker associated shall be fully rated to interrupt that magnitude of current. If there is a conflict between drawings and specifications, the higher rated value associated with that particular equipment shall be deemed to be correct.
- .4 Fusible panels shall be of the "QMQB" type consisting of a fully convertible chassis to permit assembly of units in any desired arrangement. The fusible units shall have visible blades, integral handle mechanism, cover interlock, quick-make, quick-break mechanism, front operation, high pressure fuse holders and recessed live parts. The units shall be floor mounted and shall, unless otherwise noted, be 92" in height.
- .5 Breaker panels shall be switchboard QED distribution section type with the sizes and type of breakers as shown on the drawings. Breaker(s) shall be with electronic trip(s) (LSI). The panels shall be as specified on the drawings.
- .6 Splitter troughs shall be complete with copper bus bars the length of the trough. The covers shall be bottom hinged with retained securing screws at the top.
- .7 Bussing in each panel shall be copper and shall extend the full length of the panel. Multi-section panels shall have full capacity rated horizontal bussing between each section.
- .8 Panels shall be provided with the non-ferrous plates for aluminium sheathed cables.
- .9 Panels, including tubs, shall have two coats of primer paint and two finish coats of ASA 61 grey paint.

.10 Power panels shall be of the same manufacturer as the main switchboard.

3. Execution

.1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.

.2 Locate panel boards where indicated; and mount securely and plumb true and square to adjoining surfaces.

.3 All panels less than 1520mm are to be wall mounted so that the top of the panel is 1980mm above finished floor.

.4 Connect loads to the circuits as shown on the drawings.

.5 Openings in panels shall be cut or punched. Burning of holes shall not be permitted.

.6 Each panel and switches or breakers mounted in them, shall be identified.

.7 Prior to energizing or commissioning the panels, they shall be fully inspected, tested, checked, and adjusted to include, but not limited to, the following:

.1 Grounding.

.2 Continuity of feeder cables.

.3 Breaker settings and fuses.

.4 Ground fault system operation.

.5 Breaker and switches operation.

.6 Phase resistance of feeder cables.

.7 Insulation resistance of feeder cables.

.8 Proper phasing of incoming and feeder cables.

.9 Equal division of load between parallel conductors.

.10 Trip units tested and calibrated to the settings provided by the Co-ordination Study.

.11 Bus torque, supports, clearance, general mechanical conditions, and insulation resistance.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA-C22.2 No.55, Special Use Switches.
 - .2 CSA-C22.2 No.111, General-Use Snap Switches.
 - .3 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices.
 - .4 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.

1.3 SUBMITTALS

- .1 Submit shop drawings for all products specified in Part 2.
- .2 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Light switches on 120-volt circuits under 1200 watts shall be 15 amp. and above 1800 watts shall be 20 amp.
- .3 Light switches shall be premium specification grade, A.C., Toggle type switches.
- .4 Receptacles shall be of the type shown on the drawings with the standard C.S.A. configurations and shall be specification grade. Hubbell #5262.
- .5 Light switches and receptacles on normal power shall be white unless noted otherwise.
- .6 Isolated ground receptacles shall be orange. Hubbell #1G-5262.
- .7 Wall plates for flush mounted devices shall be multiple gangs super stainless-steel type 302.
- .8 Wall plates for surface mounted devices in unfinished areas shall be metal covers for F.S. type boxes.
- .9 The weatherproof plates shall be cast aluminium with lift cover for F.S. type boxes.
- .10 For T.V. and computer outlets provide blank cover plates unless work is complete.
- .11 For telephone outlets provide blank cover plates unless work is complete.
- .12 Receptacle mounted on the exterior walls of the building shall be with ground fault protection mounted in an F.S. type box with a Hubbell #5206WO and MX3200 weatherproof in-use cover plate.

- .13 50A/208V 1 phase 3W receptacle, range receptacle Smith & Stone #1-8450 complete with plug and cord set.
 - .14 30A, 120/208V receptacle Smith & Stone #1-8430 dryer receptacle complete with plug and cord set.
 - .15 Wiring devices shall, unless otherwise noted, be of Pass & Seymour, Hubbell, Leviton, or Cooper manufacture.
 - .16 All service receptacles on roof shall be 15/20A combination GFI type receptacles complete with weatherproof in-use cover (Similar to Hubbell Cat. #MX3200).
 - .17 Receptacle controlled by occupancy sensor shall be Similar to Hubbell Cat. #BR15C2GRY.
3. Execution
- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
 - .2 Symbols on drawings show approximate locations. Care shall be taken to locate each device to ensure that it is in the appropriate location to suit the Architectural finishes.
 - .3 Mounting heights are referred to finished floor or finished ceiling unless related to benchmark elevations.
 - .4 Provide cover plates for flush mounted manual starters.
 - .5 Receptacle, telephone, etc. outlets shall, unless otherwise noted, be mounted vertically 400mm above finished floor in the finished areas and 1200mm in all unfinished areas. Thermostats shall be mounted 1400mm, unless otherwise noted.
 - .6 Telephone, P.A., etc. wall outlets shall be spaced 100mm from power outlet.
 - .7 All wiring devices cover plates shall be labelled using clear adhesive strips with black type identifying, panel and circuit number(s) for each device.
 - .8 Single throw switch(es) shall be installed with handle in "UP" position when switch closed.
 - .9 Switches shall be installed in gang type outlet box(es) when more than one switch is required in one location.
 - .10 Receptacles shall be installed in gang type outlet box(es) when more than one receptacle is required in one location.
 - .11 Suitable common cover plates shall be installed where wiring devices are grouped.
 - .12 Cover plates meant for flush mount outlet boxes shall not be use for surface mounted outlet boxes.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 248.12, Low Voltage Fuses

1.3 SUBMITTALS

- .1 Submit shop drawings for all products specified in Part 2.
- .2 Drawings to include electrical detail of fuse type, quantity, ampacity, voltage rating and dimension etc.
- .3 Submit fuse performance data characteristics for each fuse type and size. Performance data to include average melting time-current characteristics.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Fuses protecting motor circuits shall be Form I Class `J' time delay.
- .3 Other fuses up to 600A shall be Form I Class `J'.
- .4 Other fuses above 600A shall be Form I Class `L'.
- .5 All fuses shall be of Ferraz, Shawmut or Bussman.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 Provide fuses for the complete electrical installation.
- .3 Supply six (6) spare fuses of each size and type installed.
- .4 Provide in the main electrical room a wall mounted metal cabinet complete with doors and lock, and an adequate quantity of pigeonholes to accommodate the spare fuses.
- .5 To avoid confusion and possible loss the fuses shall not be stored in the cabinets until they are physically counted by the Owner's representative and a written receipt obtained for them. A copy of the receipt shall be included in the manuals.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 SUBMITTALS

- .1 Submit shop drawings for all products specified in Part 2.
- .2 Drawings to include electrical detail of disconnect switch, type, quantity, voltage, ampacity, and dimension etc.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Disconnect switch(es) shall have the operating handle interlocked with the switch cover so that it can only be opened when the switch is in the "Off" position, and the handle cannot be put in the "On" position unless the cover is closed.
- .3 Fused disconnect switch(es) shall have steel reinforced clips and fuses shall be easily removable when the switch is in the "Off" position.
- .4 Switches shall have ample gutter space for top or bottom wiring and shall have fully visible blades when in the "Off" position, quick-make, quick-break mechanism and be horsepower rated.
- .5 Disconnect switch(es) shall be provided with ON-OFF switch position indication on switch enclosure cover.
- .6 Switches used outdoors shall be in a weatherproof enclosure.
- .7 Switches shall have provision for padlocking in the "Off" position and interlock defeat.
- .8 All motors shall be provided with a disconnect switch by this Division unless otherwise noted.
- .9 The disconnect switches shall be as manufactured by Eaton, Siemens, or Square 'D'.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 Disconnect switch(es) shall be installed complete with fuses as indicated on drawings and in contract documents.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.14, Industrial Control Equipment.

1.3 SUBMITTALS

- .1 Submit shop drawings for all products specified in Part 2.
- .2 Drawings to include electrical detail of contactor, quantity, ampacity, voltage, control schematic wiring diagram and enclosure dimension etc.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 Contactors controlling panel boards or branch circuits shall be tungsten rated, electrically operated, electrically held of the size and rating specified, complete with control transformer, control circuit fuses, pilot light warning label, NO/NC contacts and On/Off/Auto selector switch.
- .3 Contactors shall be in sprinkler proof enclosure unless otherwise noted.
- .4 The contactors ampere rating shown on the drawings is the minimum continuous enclosed de-rated rating of the contactors. Contactors shall be designed and manufactured in accordance with NEMA Standards.
- .5 Contactors controlling branch circuits shall be mounted above the panel board from which they are fed, unless otherwise noted.
- .6 Contactors shall be of Allen-Bradley, Eaton, Siemens or Square 'D' manufacture.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 Field designed and assembled contactor assemblies will not be acceptable.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 REFERENCES

- .1 International Electrotechnical Commission (IEC).
 - .1 IEC 947-4-1, Part 4: Contactors and Motor-Starters.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 The motors shall be provided and adjusted by Division 23, Mechanical.
- .3 The starters shall be supplied by Division 23, Mechanical.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 Provide and connect conduit and power wiring to the motors.
- .3 Conduit and wiring for low voltage thermostats shall, unless otherwise noted, be provided by another Division of the Specification.
- .4 Wiring and conduit for line voltage thermostats shall be by this Division. Coordinate with Division 23, Mechanical drawings.
- .5 Take delivery of and install the starters and provide and connect conduit and power wiring to the starters. Control wiring and conduit shall, unless otherwise noted, be provided by Division 23, Mechanical.
- .6 Fuses for the fused combination magnetic starters shall be supplied and installed by Division 23, Mechanical.
- .7 Prepare schedule of each motor connected which shall include the following:
 - .1 Phase
 - .2 Voltage
 - .3 Horsepower
 - .4 Full load current
 - .5 Motor Purpose
 - .6 Fuse size and type
 - .7 Overload heater size and type
- .8 Submit the motor schedule for review by the Consultant and include the schedule in the manuals.

END OF SECTION

1. General
 - 1.1 APPLICATION
 - .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
 - .2 Refer to section 26 05 01, Electrical Work General Instructions.
 - .3 Refer to section 26 50 10, Lighting Fixtures Schedule
 2. Products
 - .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
 - .2 Light fixtures finish and construction shall meet ULC listings and CSA certifications related to intended installation.
 - .3 Light Emitting Diodes (LED) shall comply with the following:
 - .1 Light emitting diodes shall be manufactured by "Cree" or equal.
 - .2 Junction temperature at 25°C ambient shall not exceed 60°-70°C.
 - .3 LED light fixture(s) shall follow LM-79 and LM-80 Standards. Luminaire photometric shall be performed by an independent company.
 - .4 Lumens per watt output (LPW) shall be not less than 100 LPW.
 - .5 The lifetime rating of driver, LEDs and all electrical components of complete fixture shall be 60,000 hours (minimum) at full load.
 - .6 Colour temperature shall range from 3500K to 5100k as called for in the Lighting Fixtures Schedule.
 - .7 All electrical components shall have a 5-year replacement (parts and labour) warranty.
 - .8 LED light fixture(s) shall be DLC certified.
 - .9 LED light fixture(s) shall be complete with 0-10V dimming driver.
 - .4 The louvres for light covers in washrooms and display cases and where shown shall be 1/2"x1/2"x1/2" (13x13x13mm) continuous aluminium and shall be of American Louvre manufacture.
 - .5 Lenses shall be acrylic (minimum of 0.175mm) with a maximum flame spread rating of 250 and smoke development classification of 600 and shall be of KSH, American Louvre or Orcons manufacture.
 3. Execution
 - .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
 - .2 Remove from the site all empty cartons, crates, etc. in which the fixtures and associated components are delivered.
 - .3 Install lighting fixtures at locations as indicated on drawings and in contract documents.
 - .4 The chain supports required for mounting and installation of recessed lighting fixtures shall be supplied and installed by this Division. The supports shall be attached to the structure with minimum 2 supports per fixture. The ceiling system shall not be used as a supporting means. Prior to installation of lighting fixtures, Electrical Contractor shall coordinate with consultant and get approval.

- .5 Surface mounted fixtures shall be independently supported from the structure above.
- .6 Fixtures connected to the circuits exceeding 150 volts to ground shall be mounted at least 8 feet above floor level.
- .7 Fixtures mounted in continuous rows shall be equipped with aligning clips to form straight uninterrupted line.
- .8 Align light fixtures mounted individually parallel or perpendicular to building grid lines.
- .9 The location of lighting fixtures in Service Areas, Electrical and Mechanical Rooms, etc. shall be determined after the equipment is installed.
- .10 Refer to the Architectural reflected ceiling drawings for the exact location of the lighting fixtures.
- .11 Cooperate with the other Divisions to establish proper clearances from sprinkler heads, diffusers, ducts, etc.
- .12 Surface mounted fixtures shall have minimum clearance of 2'-0" (600mm) from adjacent sprinkler heads.
- .13 Provide additional supports, hangers etc. required to support fixtures mounted under ductwork and the fixture supports shall not be attached to either the ductwork or the ductwork supports.
- .14 Provide and connect all branch circuit conduit and wiring to the signs (if required).
- .15 Angles required for support of 1/2"x1/2"x1/2" (13x13x13mm) louvre shall be by Ceiling Division.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 SUBMITTALS

- .1 Submit shop drawings for all products specified in Part 2.
- .2 Submit the following to the Consultant for review:
 - .1 Manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Samples of materials and any other items as specified in succeeding Sections of this Division of the Specification.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 The lighting fixtures with the letter shown, shall be of the types as described below:

Type 'A' Shall be Lithonia Lighting Cat. #BLWP4-40L-ADP-ADPT-120-EZ1-LP840-BLWPQMB, 4'-0" low profile LED Wraparound light fixture complete with high performance extruded acrylic diffuser, quick mount bracket, 120-volt integral driver and other mounting accessories as required to suit fixture installation as shown on drawings.

Type 'AA' Shall be same as Type 'A' except with continuous row mounting bracket, stem suspension kit and other mounting accessories as required to suit fixture installation as shown on drawings. Cat. #BLWP4-40L-ADP-ADPT-120-EZ1-LP840-BLWPCR-SQXX. Exact stem length will be confirmed by architect at later date.

Type 'B' Shall be ILP Volumetric Troffer Cat. #VST14-4L-U-40-DIM1, 1'-0" x 4'-0" recessed LED light fixture for T-bar ceiling mounting, complete with high reflective matte white post paint finish, high transmission frosted polycarbonate lens, and 120-volt integral dimming driver.

- .3 LED light fixtures, unless otherwise noted, Influx Lighting, Saalex, Signify, Cooper, Acuity, Columbia Lighting and Hubbell Lighting shall be considered equal provided they meet the specifications, designed lighting calculations based on absolute IES files of the respective light fixtures.

END OF SECTION

1. General
 - 1.1 APPLICATION
 - .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
 - .2 Refer to section 26 05 01, Electrical Work General Instructions.
 - 1.2 REFERENCES
 - .1 Canadian Standards Association (CSA)
 - .1 CSA-C22.2 No.214 (Latest Edition), Communication Cables.
 - .2 CSA-C22.2 No.232, (Latest Edition), Optical Fiber Cables.
 - .3 CSA-C22.1, (Latest Edition), Canadian Electric Code Part 1
 - .4 OESC – Latest Edition
 - .5 OBC – Latest Edition
 - .2 Telecommunications Industry Association (TIA)/ Electronic Industries Alliance (EIA)
 - .1 TIA/EIA-568-B.1 (latest edition), Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.
 - .2 TIA/EIA-568-B.2 (latest edition), Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.
 - .3 TIA/EIA-568-B.3 (latest edition), Optical Fiber Cabling Components Standard.
 - .4 TIA/EIA-606-A (latest edition), Administration Standard for the Commercial Telecommunications Infrastructure.
 - 1.3 SUBMITTALS
 - .1 Submit shop drawings for all products specified in Part 2.
 - .2 Drawings to include equipment and material detail including dimensions.
 - .3 Submit drawings for jacks, cables, faceplates, patch panels, patch cords, wall brackets, etc.
2. Products
 - .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
 - .2 Computer/data cabling installation scope shall be as follows:
 - .1 Disconnect, relocate/ remove, and reinstall existing data cables and outlets complete with computer/ data jack and cover plates for data outlets and wireless network access points (WAP) at locations as shown on drawings.
 - .2 Coordinate exact requirement, quantities, and all associated work on site.
 - .3 Coordinate with school board IT department and disconnect, remove, and reinstall existing wireless access point (WAP) devices at locations as shown on drawings as required. Coordinate all work with school board IT department requirements and on site.
 - .4 No tie wraps shall be used anywhere. Only Velcro shall be used.
 - .5 All work performed must confirm to the latest version of the applicable codes, standards and regulations of authorities having jurisdiction.
 - .3 Hubbell products shall be used for the structured cabling system.

- .4 Connectors – Category 6 Modular Jacks
 - .1 Jacks shall be standard 8-position, Keystone, RJ-45 style.
 - .2 Jacks shall be designed for 4-pair, 100 ohm balanced unshielded twisted pair (UTP) cable.
 - .3 Each jack shall be single unit construction, with snap – fit to industry standard keystone opening (.760” x .580”).
 - .4 Jack termination method shall follow the industry standard 110 IDC punch-down.
 - .5 Jacks shall have the Category 6 designation, visible from the front when installed.
 - .6 Jacks shall not require special cords, specialty tools or special installation requirements.
 - .7 Category 6 jacks shall be backward compatible with existing Category 3, 5, and 5e cabling systems for fit, form, and function.
 - .8 Approved Manufacturers:
 - .1 Hubbell Premise Wiring NEXTSPEED Ascent **HJS6x** (x=colour code) with “COBRA-LOCK” termination is the specified Category 6 jack.
 - .2 Hubbell Premise Wiring Xcelerator Category 6 Jack **HXJ6x** (x=colour code)
- .5 Category 6 100 OHM Balanced UTP Cable – Plenum FT6
 - .1 Category 6 UTP cable construction shall be four twisted pairs of 23 AWG insulated solid copper conductors, with a ripcord, surrounded by a tight outer jacket. Cable construction also includes a pair divider along the cable centre to maintain separation of individual pairs.
 - .2 Plenum FT6 cable shall be premium grade, tested out to 550 MHz.
 - .3 Plenum FT6 cable conductor insulation diameter shall be 0.039” ± .0005” high performance fluoro-copolymer.
 - .4 Plenum FT6 cable conductor outer jacket diameter shall be 0.220” ± .008” with a nominal wall thickness of 0.015”.
 - .5 Plenum FT6 cable jacket material shall be low smoke PVC.
 - .6 Cable shall be marked: “HUBBELL PREMISE WIRING ((LINK6)) CATEGORY 6 – [PLENUM] -- 4 PR 23 AWG c(UL)US <CMP> – (UL) VERIFIED TO TIA/EIA-568-C.2 -- Z/YY (XXXX) – NNNN”.
 - .1 Frequency of marking shall be every 2.0 ft.
 - .2 (()) denotes Next-Speed Link6 series.
 - .3 [] denotes PLENUM or RISER.
 - .4 < > denotes CMP or CMR.
 - .5 ‘Z’ represents the month of manufacture.
 - .6 ‘YY’ indicates the year of manufacture.
 - .7 ‘NNNN’ indicates the sequential footage markers.
 - .8 ‘XXXX’ indicates the job number.
 - .9 ‘NNNN’ indicates the sequential footage markers.
 - .7 UL, ETL, or CSA agency certification or verification markings shall be marked on the cable jacket according to the certifying agency’s requirements.
 - .8 Colour coding of the pairs shall be as follows:
 - .1 Pair 1: White/Blue; Blue
 - .2 Pair 2: White/Orange; Orange
 - .3 Pair 3: White/Green; Green
 - .4 Pair 4: White/Brown; Brown
 - .5 Cable shall be supplied in 1000 ft Reelex boxes.
- .6 Wall Mounted Outlets
 - .1 Use 2-port flush mount faceplates. Faceplates shall be constructed of ABS moulding compound.
 - .2 Each outlet shall be served by Category 6 jack.

- .3 Faceplates shall be White in colour and shall be mounted at locations as shown on drawings.
- .4 Each faceplate shall be mounted to an in-wall single gang box by Division 26.
- .7 Surface Mounted Box
 - .1 Use a 4-port surface mount box. Surface mount shall be constructed of ABS moulding compound.
 - .2 Each outlet shall be served by Category 6 jack.
 - .3 Surface boxes shall be White in colour and shall be mounted at locations as shown on drawings.
 - .4 Provide surface mount boxes for all surface mount application.
- .8 Labels
 - .1 Labels shall be mechanically printed. Handwritten labels are not acceptable.
 - .2 Supply and install self-laminated labels at both end of each cable.
 - .3 Supply and install labels at each outlet location. Labels shall be affixed to the faceplate on the space provided by the Manufacturer.
 - .4 Label all ports at the patch panel and voice field (BIX).
 - .5 All data and voice outlets shall be labelled as follows:
 - .1 V-001 shall indicate voice outlet #1.
 - .2 DA-001 shall indicate data outlet in Hub "A", port #1.
 - .3 DB-001 shall indicate data outlet in Hub "B", port #1.
- .9 The successful bidder will be responsible for complete storage, handling, delivery, and installation of all materials.
- .10 Communication contractor will be responsible for clean-up related to his/her scope of work. The contractor will be expected to remove all debris related to his work daily. Failure to comply will expose the contractor to back-charges from the general contractor or the school board for clean-up on the contractor's behalf.
- .11 The contractor shall have tradesmen who are fully qualified and experienced in the installation of a certified communications cabling system and wireless network systems.
- .12 The successful contractor will be required to submit the following documents, prior to being awarded the contract:
 - .1 Current training and certification status by the specified manufacturer (Hubbell).
 - .2 Proof of RCDD on staff.
 - .3 Experience in construction projects for school boards.
 - .4 Experience in construction projects working for General Contractors.
 - .5 Experience in troubleshooting and problem solving in data communication networks.
- .13 At least one member of the contractor's project team must hold a current RCDD accreditation. The RCDD will be responsible for quality control and certification of the project.
- .14 A Project Manager and Foreman shall be assigned to the project within 3 working days of contract award. These personnel will not be removed from the project without the prior consent of the Owner's representative.
- .15 The contractor will not subcontract any portion of the work, unless authorized in writing by the Board's representative.
- .16 The contractor must comply with all job-site requirements for the duration of the project.
- .17 The contractor must comply with all requirements of the Occupational Health and Safety Act, without exception.

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 Computer/Data Network Cabling Installations
 - .1 All cables must be properly handled and installed in accordance with the manufacturer's specifications. Undue pulling tension, abrasion or rough handling must be avoided to ensure that the cables will permit transmission up to the design speed of 1Gb/s. All cables must be installed without splices or cuts to ensure the elimination of reflections, discontinuities, impedance mismatches, etc. The maximum horizontal length from the workstation to the LAN/ Telecom room shall not exceed 300' (90m).
 - .2 Wiring shall be mechanically protected by runs in cable tray or down drops in conduits.
 - .3 Provide associated "J-hooks" as required for proper support.
 - .4 Cabling Contractor is to adhere to all Standards, regulations, and documents for data cabling installation.
 - .5 All products installed must meet or exceed all local, provincial, and federal building, fire, health, safety, and electrical codes.
 - .6 The responsibility of the structure cabling contractor is to include but not to be limited to:
 - .1 Complete scope of work for structure cabling and devices as shown on drawings and indicated in specification.
 - .2 Supply and installation of device faceplates in surface and/or flush data outlet boxes and surface mounted raceways at locations as noted on drawings.
 - .3 Testing in conformance with noted procedures.
 - .4 Labelling of outlet faceplates and associated port on distribution panel. An "As-Built" floor plan of "outlet addresses" must be provided at the completion of the project.
- .3 Category 6 Cable
 - .1 All horizontal, UTP cables shall be continuous from end to end with no splices.
 - .2 The maximum length for horizontal cables shall not exceed 300' (90m). Tak-Tape wrap shall be used on wiring bundles. Nylon cable ties are not acceptable.
 - .3 Cables shall be installed to provide minimal signal impairment by preserving wire pair twists as closely as possible to the point of mechanical termination. The amount of untwisting in a pair because of termination shall be no greater than 0.5 inches (13mm).
 - .4 Cables shall be installed such that cables can maintain minimum bend radius of at least 4 times the cable diameter. Cables shall be terminated in such a way that there is no tension on the conductors in the termination contacts.
 - .5 Cables shall be properly labelled on front and back with the cable number and port connections for each port.
 - .6 Contractor shall adhere to TIA standard requirements regarding pulling tension and allowable lubricants.
 - .7 Contractor shall assume the responsibility for any difficulties or damage to the cable during placement.
 - .8 Contractor shall provide school board with all installed cable measurements.
 - .9 Cables shall be installed according to manufacturer's instructions.
 - .10 Firestop all openings where cable is installed through a fire barrier.
 - .11 Unless otherwise noted, all horizontal cabling shall be installed in conduit, or run in cable tray/ J-hooks. Cables shall not be left on T-bar ceiling.
 - .12 The following criteria must be met for conduit installation.
 - .1 For straight runs up to 50' (17m) the cables may occupy up to 40% of the conduit area.
 - .2 For conduit runs between 50' (17m) and 100' (30m) the cables may occupy up to 33% of the conduit area.
 - .3 For runs over 100' (30m) the cables shall not exceed 25% of the conduit area.

- .4 Each 90-degree conduit bend shall be considered as the equivalent to 30' (9m) of conduit length.
 - .5 A pull box must be installed when more than the equivalent of two (2) 90-degree bends exist in the conduit run or if the run exceeds 200' (60m).
 - .6 Strain relief will be used on large wiring bundles where they drop down to wire racks.
- .13 Conduits shall be installed following building lines. Under no circumstances shall cables or conduits be fastened to suspended ceiling support systems. Conduits shall be supported to building structure independent of other support systems.
 - .14 All conduit systems shall be left with a nylon fish string to allow for future additional cables.
 - .15 Terminations shall involve as little outer jacket removal as possible and cable pairs "untwisting" shall not exceed 1/2" (13mm). No conductors shall be visible at the rear of the TX connector.
 - .16 Slack cable must be provided to allow for minor workstation relocations. A coil of slack cable of an approximate 6' (2m) length shall be provided at workstation locations.
- .4 Penetration Through Firewalls
 - .1 A conduit sleeve shall be provided where horizontal cables penetrate firewalls. The conduit sleeve shall be sized at 40% fill ratio with a plastic bushing at both ends.
 - .2 After the conduit sleeve is installed, the opening around the conduit shall be filled with ULC listed firestop and smoke seal materials.
 - .5 Outlets
 - .1 Single data outlet shall receive one (1) 4-pair of Category 6, FT-6 rated cables. Each dual data outlet shall receive two (2) 4-pair cables. Outlets with 4 jacks shall receive four (4) 4-pair cables.
 - .2 Each cable shall be tested and identified with the faceplate also identified.
 - .3 All outlets shall be mounted 12" (300mm) above finished floor unless mounted above a counter or other work area.
 - .4 All jacks shall be wired and connected back to respective racks in LAN rooms/ closets.
 - .6 Category 6 Jacks
 - .1 Jacks shall be installed to provide minimal signal impairment by preserving wire pair twists as closely as possible to the point of mechanical termination. The amount of untwisting in a pair because of termination to the jack IDC shall be no greater than 0.5 inches (13mm).
 - .2 Jacks shall be installed according to manufacturer's instructions and properly mounted in plates, frames, housings, or other appropriate mounting device.
 - .3 Jacks shall be installed such that cables terminated to the jacks maintain a minimum bend radius of at least 4 times the cable diameter into the IDC contacts. Cables shall be terminated on jacks such that there is no tension on the conductors in the termination contacts.
 - .7 Faceplates
 - .1 Jacks and/or connectors shall be terminated to the appropriate cable and inserted in the correct orientation into the faceplate prior to the mounting of the faceplate.
 - .2 Cable slack shall be stored behind the faceplate in such a way that allows the minimum bend radius of the cables to be maintained as per the following:
 - .1 UTP cable, a minimum of 1 foot of slack with a minimum bend radius of 4 times the cable diameter. Care shall be taken when mounting the faceplate to avoid crimping or kinking the cables.
 - .3 Faceplates shall be securely mounted to a surface mounted housing, a recessed box, or box eliminator bracket.

- .4 Faceplates shall be labelled with the appropriate port designations as per the EIA/TIA 606 standard.
- .8 Cable Testing and System Certification
 - .1 The structure cabling system certification shall include 100% cable testing and verification for a 1 Gb/S solution and shall be tested to level 2 link test standards with a Fluke 4000 or Omni scanner type devices.
 - .2 The verification of each cable shall be performed by the Contractor and shall be documented in original tester format and on a cable testing sheet which shall form part of the disk and hard copy documentation supplied at the end of the installation.
 - .3 Upon completion of the testing, the Consultant may ask the contractor to perform random tests of up to 30% of the cables. Cables that fail the test shall be replaced and/or corrected within three (3) days.
 - .4 All tests shall be in accordance with ANSI/EIA/TIA-568B.1, section 11, Cabling Transmission Performance and Test Requirements.
 - .5 Testing Procedures
 - .1 Testing shall include, but not be limited to the following:
 - .1 Cable length.
 - .2 Attenuation.
 - .3 Return Loss
 - .4 Insertion Loss
 - .5 Wire Map
 - .6 Near end cross talk (NEXT)
 - .7 Power sum near end cross talk (PSNEXT)
 - .8 Power sum attenuation to cross talk (PSACR)
 - .9 Power sum Equal level far end cross talk (PSELFEXT)
 - .10 Propagation Delay & Delay Skew
 - .2 Any cable not passing the testing procedure shall be replaced in its entirety. No splicing is permitted in the repair of any defective cable. Include in tender price for retesting any device/cable repaired/replaced until passing.
 - .6 Jacks shall be tested as part of the installed horizontal cabling system.
 - .7 Category 6 jacks shall be tested as part of the channel for Length, DC continuity, NEXT, PSNEXT, Attenuation, Return Loss, ELFEXT, and PSELFEXT using a level II tester for category 6 channel compliance.
 - .8 A "PASS" indication shall be obtained for all link or channel tests when tested using the appropriate level tester for the appropriate category.
 - .9 Testers shall be correctly set to test the type and manufacturer of the horizontal cable used in the link or channel being tested, including the correct NVP.
 - .10 Splicing of any cables will not be permitted for any reason.
 - .11 Test results shall be submitted in electronic format. Electronic reports shall be submitted on CD format in a Windows based database (Microsoft Excel is acceptable). All electronic reports must be accompanied by a certificate signed by an authorized representative of the company warranting the truth and accuracy of the electronic report.
 - .12 The test result documentation shall be submitted to the Consultant no later than 10 working days following the completion of the installation.
- .9 As-Built Drawings
 - .1 Contractor shall always maintain an updated copy of as-built drawings on site.
 - .2 At the end of the project, contractor shall obtain Auto Cad files from the Consultant and update them with the work performed by the contractor. Contractor shall provide one (1) soft copy of updated as-built drawings and 3 sets of prints.
 - .3 As-built drawings shall be submitted to the Consultant no later than 10 working days following the completion of the installation.

- .10 Warranty
 - .1 Communications cabling contractor will be required to provide a 25-year manufacturer's Extended Component Warranty and an Application Assurance Warranty for the entire communications cabling system. Warranty shall be in effect from the date of substantial completion as certified by the Architect.
 - .2 Communications cabling contractor shall provide certification number within two weeks of award of the project.
 - .3 Communications cabling contractor shall provide a letter of Certification within two weeks of substantial completion. This document will include the following:
 - .1 Verification of the performance of the installed system.
 - .2 Manufacturer's certification number.
 - .3 Identification of the installation by location and project number.
 - .4 The system manufacturer shall provide to the Owner that in event of the demise or failure of the installing certified system installer/vendor, the manufacturer shall be responsible for providing another certified system installer/vendor to fulfil the remainder of the warranty conditions.
 - .5 The Contractor shall provide a guaranteed twenty-four (24) hour response time to any warranty claims.
 - .6 Contractors must ensure that the selected network cabling component manufacturer and the wiring manufacturer must have contractual relationships to ensure that the system warranty is a one point of contact, true "end-to-end" structured cabling system warranty.
- .11 Pre-qualified computer network sub-contractor for structure cabling:
 - .1 Millside Total Communications Inc.

Contact: Jamie Rose
Tel: 905-876-1110 Ext-204
Cell: 416-726-7823
Email: jamie@millsidetc.com
Unit #1-975 Fraser Drive, Burlington, ON L7L 4X8

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

2. Products

- .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical.
- .2 The existing P.A. system shall remain and shall be operational at all times.
- .3 Provide associated outlet boxes, back boxes, P.A. system wiring, P.A. system devices, testing, conduits terminated in corridor and provide extension to the existing system as shown on drawings and indicated in specification and in accordance with manufacturer recommendation. Provide all associated components to suit.
- .4 New P.A. system speaker/horn shall match existing unit.
- .5 All new P.A. system devices i.e., P.A. system speaker(s), horn(s) etc. shall match existing and shall be compatible with existing P.A. system panel.
- .6 Relocate existing P.A. system devices as shown on drawings. Extend associated conduit, wiring, provide new back boxes as required and adjust all components to suit. Coordinate all work on site.
- .7 New P.A. system wiring shall be plenum rate FT-6 type, 24 AWG, two (2) twisted pair to match existing wiring. Install new wiring in new outlet/back boxes, conduits, and "free run" in corridor ceiling space. Provide associated "J-hooks" as required for proper support.
- .8 Install wiring in new conduits/outlet boxes.
- .9 Terminate new wiring in existing P.A. system panel.
- .10 Terminate all conduits in corridor ceiling.
- .11 The fish wire shall be installed in each conduit.
- .12 All distribution conduits shall be complete with slip sleeves to permit the installation of the distribution cables.
- .13 Installations of equipment and wiring shall be done in accordance with manufacturer's recommendations and school board requirements.
- .14 After completion of the system provides verification report by system manufacturer/installer.
- .15 Pre-qualified public address system sub-contractor:
 - .1 Hamilton Video & Sound Limited
Contact: Gord Faulkner
Tel: 905-522-1200 Ext-109
Cell: 905-746-4999
Email: gord@hvs.ca
1350 Osprey Drive Ancaster, ON L9G 4V5

3. Execution

- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
- .2 Provide conduits, outlet boxes and other materials as required and/or shown on the drawings for installation of P.A. system devices and equipment.
- .3 Conduits for P.A. devices shall be terminated as shown on the drawings. Coordinate all work with the P.A. system supplier/installer.
- .4 The installation shall be in accordance with the Board's requirements.
- .5 All distribution conduits shall be complete with slip sleeves to permit the installation of the distribution cables.

END OF SECTION

1. General

1.1 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Refer to section 26 05 01, Electrical Work General Instructions.

1.2 REFERENCES

- .1 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524 - Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525 - Audible Signal Device for Fire Alarm Systems.
 - .3 CAN/ULC-S526 - Visual Signal Devices for Fire Alarm Systems.
 - .4 CAN/ULC-S527 - Control Units.
 - .5 CAN/ULC-S528 - Manual Pull Stations for Fire Alarm Systems.
 - .6 CAN/ULC-S529 - Smoke Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S530 - Heat Actuated Fire Detectors for Fire Alarm Systems.
 - .8 CAN/ULC-S531 - Standard for Smoke Alarms.
 - .9 CAN/ULC-S536-S537 - Burglar and Fire Alarm Systems and Components.
 - .10 CAN/ULC-S548 - Water flow Indicators for Fire Protective Signalling Systems.
- .2 National Fire Protection Agency (NFPA)
 - .1 NFPA 72 - National Fire Alarm Code.
 - .2 NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

1.3 SUBMITTALS

- .1 Submit shop drawings for all products specified in Part 2.
- .2 Submit manufacturer's printed product literature, specifications and data sheets as required and specified in specification.
- .3 Submit equipment and zoning layout complete with wiring diagram.

2. Products

- .1 The fire alarm system is existing of Mircom manufacture and must be operational at all times. All new devices must match existing.
- .2 Provide extension to the existing system Mircom FX-2000 as shown complete with F.A. devices and all necessary alarm, supervisory, and shut-down, modules as required for proper installation and operation. F.A. panel shall support existing and new zones. Adjust all components to suit.
- .3 All new devices shall match existing F.A. manufacturer (F.A. pull stations, smoke and heat detectors, F.A. speakers, duct detectors, etc.).
- .4 Where indicated on the drawings; remove or relocate existing fire alarm speaker/strobe, F.A. pull stations, F.A. detectors, F.A. duct detectors etc. as shown.
- .5 Before re-installation, the F.A. speakers, F.A. pull stations or F.A. detectors shall be cleaned, tested, and restored to a sound and operating condition. Coordinate with drawings.
- .6 Provide new F.A. devices i.e.: F.A. speakers, pull stations, heat and smoke detectors, duct detectors, etc. as shown on the drawings.

- .7 The existing fire alarm control panel shall be modified/expanded to suit F.A. zones as shown on the drawings. Adjust and add all components to suit.
 - .8 The existing F.A. graphic shall be replaced with new multi-colour passive graphic to suit existing and new F.A. zones.
 - .9 Existing F.A. annunciator(s) shall be modified to suit existing and new F.A. zones.
 - .10 Combustion detectors shall operate on the ionization principle and shall be activated by the presence of combustion products. The detector shall be listed by Underwriters' Laboratories of Canada. The detector shall be a plug-in unit containing two ionization chambers, an amplifier-switching circuit and indicator lamp. The unit shall contain no moving parts. One chamber shall be for detection and the second chamber shall function as a reference, to stabilize the detector for changes in temperature, humidity, and pressure. It shall be possible to electrically check the detector's sensitivity and re-adjust the detector's sensitivity as required. The detector shall have incorporated a pilot light.
 - .11 The duct detectors shall be the same as the area detectors but shall include a duct mounting assembly, sampling tubes and remote indicating unit.
 - .12 End-of-line resistors shall be provided by this Division for the complete system.
3. Execution
- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
 - .2 The equipment shall be installed strictly in accordance with the manufacturer's requirements and recommendations and the requirements of the Authorities having jurisdiction.
 - .1 Canadian Electrical Code.
 - .2 Canadian, Provincial and Local Building codes.
 - .3 Local Authorities Having Jurisdiction.
 - .4 Underwriters Laboratories Canada Inc.
 - .5 ULC, BSA.
 - .3 Install wiring to conform with the requirements of the Canadian Electrical Code. Size wiring in accordance with Class 2 requirements, except for A.C. Signal Circuits where the wiring shall be sized in accordance with Class 1 requirements but be protected from mechanical injury or other injurious conditions such as moisture, excessive heat, or corrosive action in conduit. Connect wiring to the screw terminals in the devices.
 - .4 Install fire alarm systems in accordance with the latest Standards as identified in Section 1.2.1 above.
 - .5 Install end-of-line resistors in a separate outlet box with grille.
 - .6 Provide a complete system of relays for the auxiliary functions.
 - .7 Mechanical connectors are not acceptable. Solder and insulate all joints if wire cannot be continuous.
 - .8 Wire with colour coded conductors.
 - .9 Supervise all wiring.
 - .10 All wiring shall have copper conductors.

- .11 Prior to energizing or commissioning the system, the F.A. system shall be fully inspected, tested, checked, and adjusted to include, but not limited to, the following:
 - .1 That the type of equipment installed is that designated by the specifications.
 - .2 That the wiring connections to all equipment components show that the installer has complied with ULC and CSA requirements.
 - .3 That the equipment has been installed in accordance with the manufacturer's recommendations and that all devices have been operated and tested to verify their operation and that the system operates in accordance with the requirements of the Specification.
 - .4 That the supervisory wiring of those items of equipment connected to a supervisory circuit is operated as specified.
 - .5 Those Governmental regulations will be met to the satisfaction of inspection office.
- .12 The inspection and testing reports and certification of fire alarm system prepared by the fire alarm vendor shall be submitted for review by the Consultant. This work shall be complete 3 weeks prior to occupancy date.
- .13 The "dB" readings shall be provided by the fire alarm system vendor in each area/room where audible devices are installed (part of this Contract). The testing report shall be prepared and submitted for review by the Consultant. This work shall be complete 3 weeks prior to occupancy.
- .14 System changes shall be verified by the manufacturer's representative, and a verification certificate presented upon completion in accordance with CAN/ULC-S537 (Latest Edition) - Standard for Verification of Fire Alarm Systems.
- .15 Warranties all materials, installation, and workmanship for one (1) year from date of acceptance, unless otherwise specified.
- .16 System installation and operations shall be verified by the manufacturer's representative, and a verification certificate presented upon completion. The manufacturer's representative shall be responsible for an on-site demonstration of the system operation and initial staff training as required by the Owner and/or Consulting Engineer.
- .17 When the fire alarm system has been commissioned and verified it shall be fully demonstrated by this Division to the authorities having jurisdiction.

END OF SECTION

1. General
 - 1.1 APPLICATION
 - .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
 - .2 Refer to section 26 05 01, Electrical Work General Instructions.
 - 1.2 REFERENCES
 - .1 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524 - Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S537 - Standard for Verification of Fire Alarm Systems.
 - .3 CAN/ULC-S1001-11 – Integrated Systems Testing of Fire Protection and Life Systems.
 - .2 National Fire Protection Agency (NFPA)
 - .1 NFPA 72 - National Fire Alarm Code.
 - 1.3 SUBMITTALS
 - .1 Fire alarm verification report and verification certificate in accordance with CAN/ULC-S537 - Standard for Verification of Fire Alarm Systems.
 - .2 Integrated systems testing of fire protection and life systems report and certificate in accordance with CAN/ULC-S1001-11 – Standard for Integrated Systems Testing of Fire Protection and Life Systems.
2. Products
 - .1 Except for those items as may be specified in Part 3, of this Section, refer to Part 2 of the various Sections of Specification, Division 26 Electrical
 - .2 Verify Fire Alarm System complete with all fire alarm zones in accordance with CAN/ULC-S537 (Latest Edition) - Standard for Verification of Fire Alarm Systems.
 - .3 Employ and pay for the services of an independent company, (i.e.: CFMS-West, Contact: Joseph Tanel; Ph: 647-400-9872; email: joseph_tanel@cfmwest.ca, Lonergan Engineering Inc., Contact: Michael Lonergan; Ph: 416-684-2305; email: m.lonergan@lonerganeng.com, Vintage Fire and Life Safety Ltd.; Steve Salese; Ph: 519-998-8944; steve@vintagefireandlifesafety.com or Approved Equal) to inspect, test and verify the operation of the fire alarm system in accordance with CAN/ULC-S1001-11 for Integrated Systems Testing of Fire Protection and Life Systems.
 - .4 Complete the installation, inspection, testing and verification of the fire alarm system as specified in Section 28 46 00, and perform "Integrated systems testing of fire protection and life systems" in accordance with CAN/ULC-S1001-11 with independent company and advise the Consultant and authority having jurisdiction in writing accordingly by providing all supporting documentation as required for CAN/ULC-S1001-11 inspection, testing and verification process three weeks prior to substantial completion of the contract.
 - .5 Provide all information, drawings, documents, shop drawings, and assistance to the independent company who will be performing inspection, testing and verification of integrated system testing of fire protection and life system in accordance with CAN/ULC-S1001-11.

- .6 Coordinate with fire alarm system manufacturer, fire alarm system verification contractor and other trades and contractors for door hardware system, access control system, elevator system, mechanical systems, sprinkler and standpipe systems, building controls system, lighting control systems, security system etc. and facilitate to provide all required assistance necessary in order that the inspection, testing and verification in accordance with CAN/ULC-S1001-11 for Integrated systems testing of fire protection and life systems as specified herein can be successfully completed.
 - .7 Integrated Systems Testing of Fire Protection and Life Systems shall verify that the systems, their components including but not limited to Fire alarm systems, Sprinkler systems, Standpipe systems, Elevators, Hold-open devices, Cooking suppression system, Emergency generators, Fire pumps, Emergency Lighting systems, Electromagnetic locks, Smoke control systems, Ventilation (Pressurization) systems, Audio/Visual and/or Lighting controls, Notification systems, Water supplies, Water control valves, Freeze protection systems, Fixed fire suppression systems etc. and their interconnections with other building systems are functioning in accordance with the intent of their design.
 - .8 The independent company who will be performing inspection, testing and verification of integrated system testing of fire protection and life system in accordance with CAN/ULC-S1001-11 and acting as Integrated Testing Coordinator (ITC) shall include and perform all procedures as required by CAN/ULC-S1001-11 but not limited to:
 - .1 ITC shall develop and prepare an Integrated Testing Plan specific to the project, outlining the required tests and necessary functional results to conduct integrated fire protection and life systems testing.
 - .2 ITC shall attend construction meetings prior of integrated testing procedure; to review the integrated testing process with the architect, consultant, electrical contractor, mechanical contractor, general contractor, and owner's representative.
 - .3 ITC shall review all relevant shop drawings during construction.
 - .4 ITC shall attend site prior to day of testing to review testing process with project team/ electrical contractor and confirm all systems are ready for testing.
 - .5 ITC shall discuss with the project team/ electrical contractor, the testing process to ensure all trades are aware of their expectations on day of testing.
 - .6 ITC shall ensure that integrated testing (IT) Plan is reviewed by consultant team prior to testing.
 - .7 ITC shall ensure that all applicable system start-up reports are received prior to testing.
 - .8 ITC shall perform testing of integrated fire protection and life safety systems in accordance with CAN/ULC-S1001-11 and integrated testing plan.
 - .9 ITC shall submit an integrated testing report, specific to the project and documenting the implementation of the integrated testing plan. The report shall confirm and acceptable to the requirements of the authorities having jurisdiction.
3. Execution
- .1 Except for those items as may be specified in Part 2 of this Section refer to Part 3 of the various sections of Specification Division 26 Electrical.
 - .2 Inspect and test the fire alarm system and auxiliary equipment in accordance with CAN/ULC-S537 and integrated testing in accordance with CAN/ULC-S1001-11 as specified in Section 28 46 00 and as described above and complete and sign all necessary forms.
 - .3 Provide a letter addressed to the Consultant confirming that the fire alarm system verification and integrated testing have been satisfactorily completed.

END OF SECTION