ELECTRICAL SPECIFICATIONS

EASTVILLE TRANING CENTRE
1 EASTVILLE AVENUE
TORONTO, ONTARIO. M1M 2N5
EMERGENCY LIGHTING &
FIRE ALARM SYSTEM
UPGRADE

SURI & ASSOCIATES LTD.
SAL Project No.: 19-214
Date: July 2023

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CONTENT

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Division 1, General Requirements, is a part of this Section and shall apply as if repeated here.

1.2 APPLICATION

.1 This section applies to and is a part of all Sections of Division 16.

1.3 WORK INCLUDED

.1 Sections of these Electrical Specifications are not intended to delegate functions nor work and supply to any specific trade and the work shall include all labour, materials, equipment and tools required for a complete and working installation as described.

1.4 INTENT

.1 Mention herein or indication on drawings of articles, materials, operations or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated and; performance of each operation prescribed with furnishing of necessary labour, equipment and incidentals for Electrical Trade, Division 16.

.2 Supplementary to definitions established are: `Supply' shall mean furnishing to site in location required or directed complete with accessory parts. `Install' shall mean set in place and secured or affixed to building structure as noted or directed. `Provide' shall mean supply and install as each is described.

.3 Where used, wordings such as "approved, to approval, as directed, permitted, permission, accepted, acceptance", shall mean: approved, directed, permitted, and accepted, by authorized representative of the Owner.

.4 Equipment and installation provided under this Division shall conform to applicable standards and regulations of the following organizations:

Canadian Standards Association (CSA)
Underwriter's Laboratories of Canada (ULC)
Ontario Electrical Safety Code (OESC)
Electrical Safety Authority (ESA)
Ontario Building Code (OBC)

1.5 WORKMANSHIP

.1 Workmanship and method of installation shall conform to best standards and practice. Where required by local or other By-Laws and Regulations, tradesmen shall be licensed in their trade.

1.6 TEMPORARY & TRIAL USAGE

.1 Temporary or trial usage of any equipment or materials shall not be construed as evidence of acceptance of same and no claim for damage shall be made for injury to or breaking of any part of such work which may be so used.

1.7 BY-LAWS & REGULATIONS

.1 Work shall conform to the latest rules, regulations and definitions of the Canadian Electrical Code and applicable Municipal and Provincial Codes and Regulations, and with requirements of other authorities having jurisdiction in the area where work is to be performed. Minor changes required by an authority having jurisdiction shall be carried out without change to the Contract amount. Standards established by drawings and specifications shall not be reduced by applicable codes or regulations.

1.8 PERMITS & FEES

.1 File Contract Drawings with proper authorities and obtain their approval of installation and permits for same before proceeding with work. Prepare and submit necessary detailed shop drawings as required by Authorities.

.2 Pay all fees in connection with examination of drawings, permits, inspections and final certificate of approval.

1.9 CERTIFICATES

.1 Finish necessary certificates as evidence that work installed conforms to laws and regulations of authorities having jurisdiction.

1.10 GUARANTEE-WARRANTY

.1 Guarantee and warranty requirements of the Contract shall apply except for incandescent lamps which shall be guaranteed for a period of ninety days after acceptance by the Owners.

1.11 SPECIFICATIONS, DRAWINGS, AND JOB CONDITIONS

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

.2 Examine site and local conditions. Examine carefully all drawings and complete specifications to ensure that work can be satisfactorily carried out as shown. Before commencing work, examine the work of other Sections and report at once any defect or interference affecting the work, its completion or warranty. No allowance will be make later for any expense incurred through failure to make these examinations or to report any such discrepancies in writing.

.3 Relocate equipment and/or material installed but not coordinated with work of other Sections as directed, without extra charge.

.4 Furnish "built-in" items in ample time and give necessary information and assistance in connection with building-in of same. Notify Section concerned in writing of size and location of recesses, openings and chases at least 48 hours before walls are erected, floors poured and similar work.

1.12 TENDER & SUBSTITUTIONS

.1 Tender shall be submitted based on specified manufacturer or "approved manufacturers" and equipment only.

.2 Substitutions for materials may be proposed by submitting details with Supplementary Tender Form together with price difference to Stipulated Sum Tender amount under the following conditions:

1. Product name shall be stated together with price difference, if any, to stipulated sum for each substitution proposed.

2. Material or equipment substituted shall not exceed space requirements allocated. Extra charges will not be allowed for any additional installation cost resulting from acceptance of proposed substitutions.

3. If an item of material specified is unobtainable or unavailable to meet proposed completion, state in tender the proposed substitute and amount to be added or deducted for its use. Extra charges will not be allowed for substitutions after the Contract has been awarded.

1.13 INTERFERENCE DRAWINGS

.1 Prepare and submit composite interference drawings if required to avoid and/or resolve conflict of trades and to co-ordinate work of Electrical Division with all other trades.

.2 Interference drawings shall indicate exact arrangements, of all areas and equipment to scale with dimensions.

.3 Co-operate with work of Division 15 and provide data requested and as required in the preparation of interference drawings for the work of Division 15.

.4 Make interference drawings in conjunction with all parties and trades concerned showing sleeves and openings and passage of electrical work through building structure. Drawings shall also show inserts, special hangers and other features to indicate routing through confined spaces, installation of equipment in such areas.

.5 Provide detail drawings, fully dimensioned, of equipment in Boiler and Mechanical Equipment Rooms, Electrical Rooms, Fan Rooms, etc. Base equipment drawings on approved Shop Drawings and include, but do not necessarily limit to, details pertaining to access, clearances, sleeves, connections, etc.

.6 Provide detailed drawings of pulling pits, equipment bases, anchors, floor and roof curbs, etc., pertaining to Electrical work.

1.14 SHOP DRAWING MATERIAL & LISTS

.1 Prepare and submit shop drawings and lists of materials for review in accordance with Architectural Sections. Make submittals of more than two pages in booklet form. Individual and loose drawings will not be accepted for review.

.2 Prior to equipment fabrication, delivery or installation, submit complete lists of materials proposed, indicating manufacturer, catalogue numbers and complete performance data.

.3 Review of Shop Drawings by Consultant is for sole purpose of ascertaining conformance with general design concept. This review shall not mean that Architect and/or Engineer approves detail design inherent in Shop Drawings, responsibility for which shall remain with Contractor and such review shall not relieve Contractor of his responsibility for meeting all requirements of Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of work with all trades.

.4 Shop drawings transmitted via facsimile (fax) machines, or copies of same, will not be accepted for review.

1.15 RECORD DOCUMENTS

.1 Conform to General Requirements. Maintain at least 2 sets of documents and clearly mark on same as job progresses, changes and deviations from work shown so that on completion Owner will have records of exact location of ducts and equipment and record of material and equipment changes.

.2 Record all homerun conduits, junction boxes for complete lighting, power and systems on As-Built Drawings.

.3 Contractor shall obtain clean set of prints from Consultant at start of Contract Work and shall keep these prints up-to-date at jobsite, accurately recording all changes made on project and locating all services, equipment, etc. which may have been shown only diagrammatically on Contract Documents.

.4 Contractor shall ensure that as-built information is accurately recorded and shall check same. As-Built drawings shall be reviewed with Consultant at each jobsite meeting.

.5 Upon completion of Contract Work, prior to Substantial Performance inspection and after final review with Consultants, Contractor shall neatly transfer recorded information and make final As-Built submission to Consultant in the following form:

- One (1) set of clean, legible prints.
- Updated ACAD R2010 drawings.

.6 Consultants shall be responsible for reviewing As-Built information provided by Contractor. Revise drawings to suit any comments until acceptable for submission to owner.

1.16 JOB SITE WORK SHOP AND STORAGE

.1 Supply job site office, workshop, tools, scaffolds and material storage as required to complete the work of this Division. Location of temporary buildings, use of space on site or within building shall be to later direction.

1.17 PROTECTION

.1 Securely plug or cap open ends of electrical raceways or equipment to prevent entry of dirt, dust, debris, water, snow or ice. Clean all equipment inside and outside before testing.

.2 Equipment stored on site shall be protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts.

.3 Protect work installed from damage. Secure all unfinished or loose work to prevent movement.

1.18 INSTRUCTIONS TO OPERATOR

.1 Instruct Building Operators in repair, maintenance and operation of Electrical Systems and associated equipment.

.2 Supply three (3) full Operation and Maintenance Instructions each in stiff cover, three-ring binder (Minimum 1-1/4”) suitably indexed, separated and labeled. Operate each item of equipment in presence of Operators to ensure understanding of working parts and function of each item of equipment. Supply one complete set of "Reviewed" Shop Drawings in separate hard cover binder suitably separated and labelled for Owner's use. Provide complete O&M Manual including approved shop drawings, inspection certificate(s), verification report(s), warranty letter(s) & other closeout documents in four (4) copies of CD’s or USB’s including one (1) copy for consultant’s records.

.3 Operation and maintenance manuals shall be carefully prepared in co-operation with equipment manufacturers and include miscellaneous parts necessary for proper, efficient operation of all equipment.

.4 Manuals shall also include spare parts list for each type of equipment, component, control and device installed together with manufacturer's name and address so such items can be suitably identified and purchased. Include list of recommended spares.

1.19 CLEANING, LUBRICATION AND ADJUSTMENT

.1 Immediately prior to completion of work:

1. Remove all dust, dirt and other foreign matter from internal surfaces of enclosed electrical apparatus and equipment.

2. Remove all temporary protective coverings and coatings, temporary labels.

3. Clean, repair, lubricate and adjust all mechanism and moveable parts of apparatus and equipment leaving it in new condition and operating properly.

4. Balance demand loads for service and distribution feeders within 5 percent upon completion of work and after the building is in full operation.

1.20 INSPECTION & TESTING

.1 Systems, equipment, and all major items of material shall be tested to the satisfaction of the Architect, and as required to establish compliance with plans and specifications, and with the requirements for the Supply and Inspection Authorities.

.2 Faulty and defective equipment shall be replaced with new materials. Conductors which are found to be shorted or grounded, or to have less than proper insulation resistance, shall be replaced with new conductors.

.3 Tests shall include but are not limited to the following:

1. Test of secondary voltage cables shall include megger tests to establish proper insulation resistance, and phase-to-ground resistance of cables.

2. Proper functioning of all systems.

3. Polarity tests - to establish proper polarity connections to all sockets and receptacles.

4. Test of system neutral to establish proper insulation resistance and isolation of neutral from ground except for required ground connection at Service.

1.21 CERTIFICATE OF TESTS

.1 When work is complete submit three copies of test results and a signed statement listing all tests that have been performed as required by specifications and manufacturer's instructions.

1.22 COMPLETION

.1 Provide receipts from designated representative of Owner for portable and loose materials

.2 Provide copy of final inspection certificate from Electrical Inspection Authority.

.3 Provide manufacturers corrected "as built" shop drawings for all major electrical items and systems, including all shop drawings returned for modifications.

1.23 ALTERATIONS TO EXISTING BUILDING

.1 Note that certain alterations and structural changes are to be made to existing building. Architectural drawings and site are to be examined to determine extent of alterations affecting existing electrical systems. Where existing conduits and wires run through areas to be altered, to feed other parts of existing building, they shall be re-routed and reconnected to maintain their original function. Drawings do not necessarily indicate outlets, switches, receptacles, and the like, and other electrical equipment which are required to be relocated or abandoned. Provide decorative blank cover plates for obsolete outlet boxes remaining.

.2 Electrical services and auxiliary services (fire alarm, and the like) shall be maintained continuously without interruption. Interruptions to services shall be confined to periods of time to be designated by Architect, and/or Owner’s designated representative. Include in tender for temporary connections, overtime labour charges, and such related allowances in order to conform to these conditions.

.3 The Electrical Contractor is responsible for removal, reinstallation, cutting and patching of ceiling and walls as required in the existing building.

.4 Cutting directly related to electrical work, regardless of whether such work occurs in new or existing construction, shall be coordinated and paid for by Electrical Subcontractor involved, under supervision of Contractor.

.5 Where existing electrical items or systems are demolished and removed from existing construction assemblies, Electrical Subcontractor involved shall be responsible for infilling entire hole left after removal of item or system with new construction assembly to match existing. Where new electrical items or systems are installed through existing construction assemblies, Electrical Subcontractor involved shall be responsible for properly sized and accurate cutting of existing construction assembly to allow installation of new work.

1.24 PROJECT RELATED NOTES

.1 All devices/equipment (including the switchgear, power transformer and all other electrical and non-electrical material, equipment and parts) shown on the new/proposed layouts are expected to be fully supplied and installed as a part of this project, unless explicitly mentioned otherwise. Modify and/or extend existing wiring and conduits as required to suit the demolition and/or proposed scope of work. Perform all work in strict compliance with the Ontario Electrical Safety Code and requirements of the Electrical Safety Authority.

.2 All patching, repairing, painting and making good of existing surfaces shall be done under this Contract.

.3 Unless otherwise noted in writing in the Contract Documents, the Contractor is responsible to furnishing all materials, labour, equipment, etc. required to complete the work as per the Contract Documents. It should not be assumed whatsoever that the Owner or any other party will furnish any material, labour, equipment, etc. required to complete the work unless explicitly noted in the tender documents.

.4 All conduits, raceways, electrical boxes and uni-struts installed in finished areas shall be painted on site to match the adjacent paint colour and finish. Paint prior to installation. Touch up upon installation to ensure consistency.

.5 All waste material, devices, parts, old switchgear, power transformer, raceways/conduits, wiring, and equipment shall be removed off site by the Contractor and disposed of on a daily basis. All removal and disposal costs shall be included for in the tender price. Disposal of the old system (c/w wiring, raceways, devices, panels, etc.) shall be included for in the tender price. Include in tender price for the destruction and breakdown of all equipment as required to facilitate transportation out of the building.

.6 All fire-stopping work associated with penetrations through all walls, floors, and ceilings in the area of work (including all existing and new penetrations) shall be done by the Electrical Contractor under this Contract. Fire-stopping shall be completed in compliance with ULC requirements, Code requirements and the requirements of all Authorities having Jurisdiction.

.7 All work shall be done after hours during hours approved by the Facility Staff.

.8 Protect surroundings, the Property and the Building throughout Construction. Repair all damages done at no cost to the Owner.

.9 Include for all cutting, coring, trenching, excavating, x-raying and scanning work as required to complete the proposed or demolition scope of work. Repair to match original condition.

.10 Make substitutions/allowances in the tender price if a particular component or product specified would not be compatible with the approved system. It is the responsibility of the bidding Contractor to notify of any such condition to the Consultant prior to bid submission.

.11 Include for all modifications to the existing building required to facilitate entry of new electrical equipment into existing spaces. Where possible, modifications shall be avoided if alternate materials/equipment are available that could avoid any such modifications.

.12 The Contractor must prepare, if requested by the Consultant, a summary of the findings of all investigative work required to facilitate ordering of the correct equipment including, but not limited to the following:

.1 Existing breaker/fuse ratings (including opening up of existing equipment as required to gather this information).

.2 Downstream load ratings (mechanical equipment, electrical panels, loads, etc.)

.3 Wire and conduit sizes.

.13 If downtime of any electrical service is required to carry out the investigation work, include for a generator to ensure continuity of essential services (fire alarm, security).

.14 Equipment (panels, switchboard, disconnect switch, etc.) selection shall be made in accordance with available space on site, requirements of all Authorities having Jurisdiction and requirements of the Ontario Electrical Safety Code. Price and order equipment to suit. Allow for custom equipment where required to meet Contract Requirements. Maintain all mandated clearances.

.15 Include for a pre-consultation with the Electrical Safety Authority Inspector to review all scope of work prior to ordering of any equipment. Include for al fees in the tender price.

.16 Make all necessary modifications to the building construction and adjacent mechanical systems (ductworks, piping, etc.) as required to facilitate installation of new equipment and/or materials. Such scope is not necessarily explicitly shown on the drawings. It is the Contractor's full responsibility for carefully assessing the area of work at the time of pricing, obtaining (from Suppliers) the proposed equipment for this tender prior to pricing and including for all required modifications required to facilitate installation.

.17 All new meter cabinets required as per the drawings shall be fully supplied and installed under this Contract. Meter cabinets **will not** be supplied or installed by Toronto Hydro.

.18 Include for all coordination of work with Toronto Hydro, Electrical Safety Authority and the Solar Installer (where applicable).

.19 Where standard size electrical equipment is not available for the given available sizes, include for Custom Equipment manufactured in full compliance with all governing codes for such equipment.

.20 Site verify potential temporary generator locations prior to pricing during the pre-tender walkthrough and allow for all wiring necessary to achieve the desired back-up power.

.21 Site verify all existing building openings planned to be used for the transport of all existing and new equipment during the pre-tender walkthrough. Note that door openings shown on the drawings are not to scale and shall not be used for pricing purposes.

.22 Include for all upgrades and/or special services as required to tilt, rotate or alter the Equipment's orientation as required to facilitate transport to the proposed locations to clear all existing services and the building construction.

1.25 DEFINITIONS

.1 The following words shall be interpreted as listed below when found anywhere in the tender package:

1. "Concealed" means hidden from normal sign in furred spaces, shafts, ceiling spaces, walls, or partitions.

2. "Exposed" means work normally visible, including work in equipment rooms, tunnels, and similar spaces.

3. "Provide" (and all tenses) means supply and install for a complete and operational system.

4. "Install" (and all tenses) means secure in position, connect as specified, test, and verify.

5. "Supply" means to supply all devices/equipment to the responsible trade.

6. "Remove" means to disconnect, remove all devices and all associated wiring and raceways to the source, dispose of all redundant parts, materials, etc., and patch and make good all surfaces affected by the removal.

PART 1 PRODUCTS

Not Applicable.

PART 2 EXECUTION

Not Applicable.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Conform to Section 16010 - Electrical General Requirements.

1.2 MATERIALS

.1 Materials shall be new, of Canadian manufacture where available, first quality and uniform throughout. Submit tender based on the use of materials and equipment specified, or on the listed acceptable alternate equipment as further detailed.

.2 Electrical materials shall be C.S.A. approved and be so labeled. Material not C.S.A. approved shall receive acceptance for installation by Electrical Safety Authority (ESA) Special Inspections Branch before delivery, and modifications and charges required for such acceptance shall be included in work of this Section. Material shall not be installed or connected to the source of electrical power until approval is obtained.

.3 Confirm capacity, ratings and characteristics of equipment items being provided to supply power to equipment provided under other Sections of the work. Resolve discrepancies before such items are purchased.

1.3 MATERIAL ACCEPTANCE

.1 Acceptance of materials installed presumes that materials have not been damaged or exposed to conditions that would adversely affect performance and life expectancy.

.2 If in the opinion of the Consultant, materials have sustained damage, or have been exposed to abnormal conditions it shall be the responsibility of the Contractor to have such tests performed as deemed necessary by the Consultant to establish condition and therefore, acceptability of installed materials.

PART 2 PRODUCTS

2.1 RACEWAYS

.1 Rigid galvanized steel conduit shall comply with CSA Specification C22.2 No. 45.

.2 Electrical metallic tubing (EMT) shall comply with CSA Specification C22.2 No. 83. Connectors and couplings to be forged steel and rain tight in sprinklered areas. Connectors to have factory-installed insulated throats.

.3 Rigid PVC conduit shall comply with CSA Specification C22.2 No. 136.

.4 Watertight flexible conduit: "Sealtite" PVC jacketed flexible steel with Hubbell-Kellum strain relief grips; shall comply with CSA Standard C22.2 No. 56.

.5 Surface wall-mounted raceways shall be Wiremold No. 4000 metallic type complete with two channels and all necessary fittings, closers, device modules, etc. Wiremold or approved equal only.

2.2 WIRE & CABLE

.1 Branch wire and cable shall comprise copper conductors, sized as noted, rated 90 deg. C., 600 volt minimum flame retardant insulation, and CSA approved for application.

.2 Wire and cable installed in conduit shall be PVC insulated Type TWH - Flame retardant and comply with CSA Specification C22.2 No. 75.

.3 Use Electrovert "Z-Type" code markers for control & communication conductors.

.4 All above ground feeder and branch wiring shall be RW90. All underground feeder cables and branch circuit wiring shall be RWU90.

2.3 DEVICES

.1 Wiring devices unless otherwise specified herein, or noted, shall be as manufactured by Hubbell, Leviton or Pass & Seymour.

.2 Switches for 120 volt branch lighting circuits, generally shall be A.C. "Quiet Type" rated 20 Ampere, 120 Volt, totally enclosed phenolic housing Hubbell 1200 Series, beige toggle handle.

.3 Double Pole lighting switches shall be connected to 2 pole circuit breakers.

.4 Key-operated switches shall be Hubbell 1221-L Series of the types listed above, except key-operated, and shall be keyed-alike.

.5 Standard 15 Ampere, 125 volt duplex receptacles generally shall be specification grade Hubbell Cat. No.5262, beige, CSA #5-15R.

2.4 DEVICE COVER PLATES

.1 Switch and receptacle and other device faceplates for flush mounted devices, generally shall be single or multi-gang as required, type 301, stainless steel, #4 brushed finish with removable protective covering.

.2 Weatherproof enclosures for outdoor receptacles shall be P & S 4600 with 4600-26 Mounting Plate, duplex ground fault receptacles and two #4609 Keys.

.3 Cover plates for other devices such as flush fan controls, telephone, etc., shall be stainless steel to match above.

PART 3 EXECUTION

3.1 EQUIPMENT LOCATIONS

.1 Approximate locations of electrical equipment, fixtures switches, outlets, and the like, are given on the drawings. Refer to contract drawings and room elevations for application. In absence of definite detail exact location of outlets shall be determined on site as work progresses.

.2 Device plates shall cover opening left for outlet box, and plates shall be attached to boxes in an approved manner. Outlets and fixtures are to be located symmetrically, (i.e. centered in wall panels, ceiling panels or tiles, columns, between and above doors and the like).

.3 The right is reserved to alter the location of equipment and outlets a distance of up to 3 metres without involving a change to the Contract amount, providing notice is given prior to installation.

3.2 MOUNTING HEIGHTS

.1 Mounting heights of outlets, center of outlet to finished floor, except for exposed masonry construction, shall generally be as follows:

Light Switches - 1100 mm
Receptacles - 400 mm
Manual Fire Alarm Stations – 1,150 mm
Fire Alarm Audible Temporal Pattern Horn/Strobes – As per CAN/ULC-S524.

3.3 HOLES & DRILLING

.1 Pneumatic hammers and percussion drills are prohibited.

.2 Where not sleeved, make holes through concrete walls and floors by core-drill only. Obtain Architect's approval before drilling.

.3 Seal holes and sleeves through floors to serve as water dam.

3.4 CUTTING & PATCHING

.1 Layout and install work in advance of other Sections for all new work. Bear all costs resulting from failing to comply with this requirement.

.2 Pay for cutting and patching and making good as required for work of this Division by reason of faulty or late work. Employ appropriate trades already engaged on the site to perform such cutting, patching and making good existing walls, floor, ceiling, etc. Before commencing, obtain Architect's approval for extent and nature of cutting. Make good, disturbed surfaces to the Architect's approval.

3.5 HANGERS & INSERTS

.1 Provide necessary hangers and inserts for work of this Division.

.2 Fasten to cast-in place concrete by suitable drilled or cast-in inserts.

.3 Fasten to structural steel using bolts or welded fasteners.

.4 Do not use wood, chain, wire lashings, strap or grappler bar hangers except where noted or detailed.

.5 Support fixtures independently of ceiling suspension systems. Provide additional supports as required, which shall be fastened to building structure steel members, joists, beams, etc., but not metal pan or roof decking. Material for additional supports and their installation shall comply with requirements of U.L.C. Refer to "List of Equipment and Materials" Vol. 2, and "Supplement" for application to rated assemblies.

.6 Support outlet and junction boxes independently of the conduits running to them where required by electrical code and where deemed necessary by the Architect, use steel angle brackets or steel rods to support outlets and fixtures, to the building structure.

.7 Drilled fastenings to concrete shall be self-drilling concrete anchors, Phillips 'Red-Head' or approved equal. The maximum weight per fastening shall not exceed 25% of manufacturer's 'pull-out' load data.

.8 Surface mounted or stem suspended fixtures fastened to non-removable ceilings, 2 hr. fire rated ceiling assemblies, or mounted between metal suspension of exposed T-grid ceilings, shall be provided with minimum of two points of attachment for each 300 mm x 1200 mm (1' x 4') luminaire, using metal `channel-bar' fastened to building structure. Attach luminaires to `channel-bar' by means of threaded steel rods. Channel-bar shall be adequately supported and of a construction to prevent deflection under load, as selected from manufacturer's published data, and to Architect's approval. `Channel-bar' shall be Unistrut, Burndy, Flexibar, Cantrough, or Canadian Strut Products or approved equal.

.9 Use support clips (e.g. Caddy Type IDS) for suspension of fixtures attached to exposed T-grid ceilings. Clips shall be supported directly from building structure and not from suspended ceiling system.

.10 Provide recessed fluorescent fixtures with support frames, and plastering frames where applicable.

.11 Chain where permitted and specified for the installation of fluorescent lighting fixtures shall be No. 4, 2 mm (.080") Tenso Pattern coil steel chain, plated with a strength of 82 kg (180 lbs.) as manufactured by Dominion Chain Co. Ltd. or approved equal. Where 'S' hooks are used with chain, they shall be No. 6 type with open strength of 82 kg (180 lbs.) minimum. Attachment of chain at both ends of support shall develop full strength of chain.

.12 Support outlet boxes, junction boxes, conduit and the like, mounted on exposed steel deck roofing by means of self-tapping minimum #10 gauge screws, secured through bottom member of deck corrugation. Do not pierce top of steel deck.

3.6 PAINTING

.1 Hangers, support framing and all equipment fabricated from ferrous metals which are not protected with zinc or other suitable corrosion-resistant finish shall have at least one coat of a corrosion-resistant paint applied before shipment or immediately on arrival at the site.

.2 After installation, touch up all scratches, chips, other damage and defects in paint, using zinc chromate primer or paint or special enamels as necessary to match the original.

.3 Finish and colour of all equipment shall be coordinated to provide uniform appearance.

.4 Painting of conduits and supports and other exposed surface work will be done under Painting Section except as noted. Install materials in time to be painted together with mounting surfaces.

.5 Do not paint over nameplates.

.6 Refer to other Sections for special paint finishes of equipment.

3.7 NAMEPLATES & SCHEDULES

.1 Identify electrical equipment supplied under this Division with 3 mm thick black laminated plastic nameplate to indicate equipment controlled to provide instruction or warning. Fasten each plate with two chrome plated screws. Lettering shall be 6 mm high for small devices such as control stations and at least 13 mm high for all other equipment. Submit a list of proposed nameplates for approval before manufacture.

.2 Provide panelboards with typewritten schedules identifying outlets and equipment controlled by each branch circuit including existing panels being changed. Protect schedules with non-flammable clear plastic.

.3 Identify junction boxes, pull boxes, cover plates, conduits and the like, provided for future extension, indicating their function (e.g. power, fire alarm, communication).

.4 Verify room names and numbers prior to listing on nameplates and schedules.

3.8 BRANCH CIRCUIT WIRING & FEEDER CABLES

.1 Provide branch circuit wiring, conduits and feeders as required for Lighting, Power and Auxiliary Systems. Separate conduit systems shall be provided for feeder, lighting and power systems, for exit light system and auxiliary communication systems.

3.9 CONDUIT, RACEWAYS AND WIREWAYS

.1 Wire and cable shall be installed in conduit as follows:

Rigid galvanized steel conduit with threaded IPS fittings to be used:

1. Where noted and required by regulations.
2. Where subject to mechanical damage.
3. For all exposed conduit work.

.2 Conduit embedded in concrete or buried below grade floors shall be CSA approved rigid PVC type.

.3 Electrical metallic tubing (EMT) may be used in place of rigid conduit in dry locations subject to governing regulations, embedded in masonry walls, and concealed above suspended ceilings. Connectors shall be provided with factory-installed insulated throats.

.4 Use flexible metallic conduit for connections to chain suspended and recessed fixture drops, motors and similar equipment to prevent transmission of vibration. A code-gauge green grounding conductor shall be provided for all such connections. Use "Sealtite" conduit with Hubbell-Kellum Sealtite conduit strain relief grips for all such connections at motors.

.5 Fasten every conduit and cable to structure by means of approved conduit clamps or clips. Wire lashing is not acceptable.

.6 Conceal conduits and wiring except where noted. Run exposed conduits parallel to building lines and to other conduits. Provide every empty conduit with a pull rope (3 mm polypropylene rope) and identify to designate its function (Power, Telephone, Fire Alarm and the like).

.7 Where conduit is installed in concrete slabs, obtain general approval, prior to commencing the work, on both maximum dimension and cross-overs which may be used therein.

.8 Install conduits in such a manner as to conserve head room and interfere as little as possible with free use of space through which they pass. Obtain approval for routing of same. Keep conduits at least 150 mm clear high temperature work.

.9 Conduits installed at the roof level of exposed structures, shall be run tight to roof deck, above purlins and beams.

.10 Conduit and cables for electrical work in demountable type and drywall type partitions shall enter from above, from a junction box concealed in the ceiling above and shall comprise a flexible conduit connection.

.11 All branch wiring shall be provided with a separate code gauge supplementary grounding conductor run in each conduit or duct, terminating at ground block at panelboards.

.12 Run conduit exposed in mechanical equipment rooms, electrical rooms, fan rooms, and the like, and installed after mechanical and other equipment is completed. Install fixtures, outlets, starters, etc., to clear and to suit application.

.13 Wiring, boxes, conduit fittings, etc., in hazardous areas shall conform to the Ontario Electrical Code, covering explosion-proof areas. Provide conduit seals where required by these regulations.

.14 Provide housekeeping curbs around exposed conduits feeding panels, disconnect switches, starters, etc. penetrating floors in front of walls.

3.10 WIRE & CABLE

.1 Wire and cable shall not be installed at temperatures below 20ºC unless "minus 40" type is used. Wiring to heating equipment shall be rated 90ºC minimum, the ampacity of which shall be limited to 75ºC value.

.2 Conductors used for all auxiliary systems (e.g. Fire Alarm) shall be tagged and/or colour-coded, and where applicable shall agree with manufacturer`s wiring diagrams.

.3 Minimum wire size for power wiring shall be No. 12 AWG gauge unless specified otherwise. Minimum wire size for "Common" neutral conductors shall be No. 10 AWG. Control wiring shall be #14 AWG red insulation. Maximum voltage drop between furthest outlet of any circuit, when fully energized, and panel to which it is connected shall not exceed two percent except for electric heating circuits which shall not exceed one percent.

.4 Cables shall be terminated with moisture-proof connectors, clamped to sheet metal enclosure by a single non-ferrous locknut and grounding bushing.

.5 Sheaths of multi-conductor cables shall be grounded at both cable ends.

.6 Sheaths of single conductor cables shall be grounded at supply end only. Provide a Code Gauge Grounding Conductor with each feeder cable run.

.7 Numbers of wires indicated for lighting and power, motor and motor control, alarm, signal, communications, and auxiliary systems is intended to show general scheme only. The required number and types of wires shall be installed in accordance with equipment manufacturer's diagrams and requirements, and with requirements of the installation, except that specification standards shall not be reduced.

.8 Solderless connectors with nylon-jacketed "Vibration-proof" screw-on wire connectors ideal "Wing Nuts", rated 600 volts shall be used for joints in Branch Wiring.

.9 Use compression joints and terminals for all control wiring; and all conductors #4 AWG and larger. Mechanical connections are acceptable at panelboards and circuit breakers where these are part of factory-assembly.

.10 Wire or cables in feeders, sub-feeders and branch circuits shall be colour-coded in accordance with Ontario Electrical Safety Code. Each end of feeder terminations (e.g. in Switchboard, Panelboards, switches, splitters and the like) Code Phase A - Red, Phase B - Black, Phase C - Blue, Neutral – White.

.11 Use C.G.E. Vulcan X-Link insulated cables for circuits protected by ground fault circuit interrupters.

.12 Include in each conduit, tubing and raceway, a code gauge green supplementary grounding conductor which shall be connected to suitable ground bus in equipment.

.13 Armoured or sheathed cables may be used only for wiring within demountable and dry wall type partitions and if additionally specified or detailed; however it shall not be directly buried in or below concrete slabs.

3.11 OUTLET, JUNCTION, & PULL BOXES

.1 Use suitable electrical boxes for terminations and junctions on conduit work. Install pull boxes where necessary to permit installation of conductors. Support pull boxes, outlet boxes, panels and other cabinets independently of conduit.

.2 Provide each light switch, wall receptacle and other device with an outlet box of suitable dimensions and a faceplate. Outlet boxes shall be adapted to their respective locations.

.3 "Thruwall" and "Utility" type boxes shall not be used.

.4 Electrical boxes and panels shall be CSA approved, code-gauge sheet metal, galvanized or with suitable protective treatment. Secure covers with screws or bolts.

.5 Outlet boxes shall not be installed "Back-to-Back" in walls; separate by a minimum of 150 mm.

.6 Use "Masonry Type" outlet boxes for flush installation in masonry walls as detailed on standard Detail Drawings attached hereto. Standard sectional boxes, 1004, 1104 and the like, shall not be used.

.7 Install surface mounted devices, in cast conduit fittings, with threaded hubs and suitable stainless steel faceplates.

.8 Main pull and junction boxes (excluding obvious outlet boxes) shall be clearly identified by painting the outside of the cover in accordance with the following schedule:

- Lighting Yellow
- Power Blue
- Fire Alarms Red
- Telephone Cream
- Control Brown
- Intercom & Sound Green

.9 In addition, each box shall be identified with a system and service designator of logic reference to the service.

3.12 ACCESS DOORS & ACCESS MARKERS

.1 Supply access doors for installation under the work of other Division where electrical equipment requiring maintenance or adjustment or inspection is located above ceilings, within walls or behind furring; except ceilings of lay-in removable panel type.

.2 Access doors shall be 12 gauge hinged metal Stelpro Ltd. or equal #722 flush type, minimum size 300 mm x 300 mm (12" x 12") "Reach-in" 300 mm x 600 mm (12" x 24") "Crawl-in", with prime coat finish, concealed hinges, screwdriver lock and plaster key. Access doors in finished masonry or drywall construction shall be #722 less plaster key. Access doors shall be #726 in acoustic tile ceilings; #704 in drywall ceiling and #726E in plaster ceilings.

.3 Access doors in fire rated ceiling assemblies, all fire rated walls, duct shaft or in corridor walls shall be UL, ULC or WHI listed 1-1/2 hour fire rated access doors equal to LeHage #L1010 or Acudor #150B with screwdriver lock.

.4 Where lay-in removable panel ceilings requiring hold-down clips are used, access doors are not required but panels shall be secured with accessible hold-down clips and marked with Buildemup #6 RH brass paper fasteners inserted through acoustic panel and bent over. Paint heads with blue enamel before installation.

3.13 GROUNDING – GENERAL

.1 Ground all electrical systems in accordance with provisions of the Ontario Electrical Code. Provide grounding electrodes in accordance with Section 10 of the Canadian Electrical Code.

.2 Install grounding conductors to permit the shortest and most direct path from equipment to ground. Install grounding conductors in rigid galvanized conduit with both conductor and conduit bonded at both ends. Provide bonding jumpers with approved clamps to maintain ground continuity of metallic raceway systems at all expansion joints.

.3 Ground connections to grounding conductors shall be accessible for inspection and made with approved solderless connectors bolted to the equipment of structure to be grounded. Clean contact surface prior to making connections to ensure proper metal to metal contact. Connections shall be of the type that grounds both conduit and conductor, and cap screws, bolts, nuts and washers shall be silicon bronze.

3.14 FIREPROOFING & SEALING

.1 Make watertight seal at sleeves and other openings through floors above grade. Sleeves to extend minimum 25 mm (1 inch) above finished floors.

.2 Provide Fireproofing protection of openings through floors and fire rated walls. Refer to Architectural Drawings for rated surfaces.

.3 Caulk spaces between conduit, cables, bus ducts, raceways, and cable trays with "Cerafibre" 2300 F packing to Building Department approval. Pack and seal both sides of openings with Electrovert "Flameseal" putty, minimum thickness 25 mm (1"). Install in accordance with Electrovert Instruction Bulletin #3601.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Refer to Section 16010 - Electrical General Requirements, 16050 – Basic Materials & Methods, and all other specifications sections that are a part of the Contract Documents.

.2 All specifications must be read in conjunction with the Electrical Drawings.

.3 The drawings and specifications must be read in conjunction with all front-end and bid documents (RFQ, etc.) issued by the Board and/or its representative along with the Drawing and Specification package.

1.2 WORK INCLUDED

.1 Provide emergency lighting fixtures and systems scheduled, complete with lamps, and all necessary accessories required for their complete installation, performance, and on-going operation.

.2 Additional details of 'Work Included' may be found throughout the specifications and/or drawing package.

.3 **The Contractor must verify all existing source voltages prior to submission of shop drawings.**

1.3 SHOP DRAWINGS

.1 Conform to requirements of Section 16010.

.2 The Contractor must submit electronic copies of all shop drawings for the Engineer's review and approval prior to ordering anything. The shop drawing package must include shop drawings for the following (as applicable):

- .1 Exit Signs
- .2 Remote Heads
- .3 Battery Units

Each package must contain illustrations of each fixture. Illustrations are to be complete showing dimensions light distribution and mounting requirements. Illustrations to be noted to indicate special features and finishes. A copy is to be retained by the Contractor on the site at all times, to ensure co-ordination of installation requirements. The Contractor must work with the Manufacturer to provide a photometric study based on the proposed design and the selected devices/equipment. CAD will be made available by the Engineer for the Contractor to use.

PART 2 - PRODUCTS

2.1 REFERENCE NUMBERS

.1 Catalogue reference numbers given for individual fixture types are intended as a guide when read with the description and the fixture as finally applied. Verify catalogue references with description and coordinated with installation conditions, with particular regard to wall or ceiling construction details, type and finish before ordering fixtures.

2.2 FIXTURE SCHEDULE

.1 Lighting fixtures shall be as scheduled on drawings.

2.3 EMERGENCY LIGHTING SYSTEM

.1 Emergency Lighting Battery Units:

.1 Provide Emergency Lighting Units and Wiring Systems as noted.

.2 Emergency battery units shall be designed to provide emergency lighting for at least 30 minutes automatically upon failure of a normal power source. Upon restoration of the normal power, the battery unit shall be restored automatically to a charging condition. The charging cycle shall raise the battery to an equalized voltage and then electronically sense the full state of charge in the battery and return the battery to a lower float voltage.

The charger shall be regulated to a plus or minus 20 mV output for plus or minus 10% input voltage fluctuation. In order to extend battery life at ambience other than room temperature, the charger shall reduce the battery voltage by 4 mV per cell per ^{o}C rise in temperature and shall raise the battery voltage by 4 mV per cell per ^{o}C reduction in temperature from a 20^{o}C reference temperature. The unit shall be equipped with a phase loss and brown out protection circuit which shall turn on emergency lights when input voltage to the unit falls below 90 volts or 75% full voltage. The unit shall include a test switch, charge and on pilot lights which shall be light omitting diodes. The unit shall include a low voltage disconnect circuit.

.3 Battery units shall be Stanpro SLD-24V-350Watts-1M/2M-6WLA or approved equal with design life of 10 years, 24 volt. The unit shall be performance certified and carry C.S.A. C22.2 No. 141 approval for the wattage noted. Remote heads on the battery unit shall be MR16 and LED.

.4 Wall mounted unit shall be provided with recessed back box and mounting template to allow pre-installation feeds of A.C. input and D.C. output. Both A.C. input and D.C. output shall enter unit through back face without any visible cable or conduit feeds. Provide wall mounted shelf for each battery unit.

.5 Provide a 120 volt input circuit for each unit wired to un-switched circuit indicated. Wire to exit signs from battery units. Size conductors to all remote lamps to provide maximum voltage drop of five percent.

.2 Emergency Single Remote Heads:

Shall be Stanpro #M1-12-24V-6W-LA-WH or approved equal. The decorative remote head shall be complete with 1 x 6 Watts, 24VDC, MR16 LED lamp housed in die-cast metal housing.

.3 Emergency Dual Remote Heads:

Shall be Stanpro # M2-12-24V-6W-LA-WH or approved equal. Dual remote heads shall be complete with 2 x 6 Watts, 24VDC, MR16 LED lamps housed in die-cast metal housing.

.4 Self-Powered Exit Signs:

Shall be Stanpro # RMSE-0-WH-UDC-120VAC self-powered with integral Ni-Cad battery or approved equal. All-metal construction. The frame and back plate shall each be of a one-piece steel construction. The faceplate(s) shall be constructed of robust clear Polycarbonate panels with an opaque border coloured factory-white. Provide universal pictograms (with option of standard pictogram, left directional pictogram, or right directional pictogram – provide two of each in the case of a double face exit sign) for each exit sign. The light source shall be long-life white light-emitting diodes (LED) and shall provide even illumination in normal and emergency operation. Unit must be energy efficient, consuming less than 2.5 watts. Must come complete with universal mounting kit, permitting end, wall, or ceiling installation. Must meet or exceed the requirements of CSA 22.2 No. 141-10 standard. Verify existing source(s) voltage and order to match ensuring complete operation.

.5 Acceptable Alternate Manufacturers

1. Emergi-Lite
2. Lumacell

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Do not install or energize lamps until directed by Consultant which generally shall be just prior to occupancy of the building by the Owner.

.2 Provide wiring in conduit and install devices in accordance to all Manufacturer recommendations and instructions. Advise the Consultant of any discrepancies or conflicts between the instructions set out in these drawings and specifications and the Manufacturer's recommendations and instructions prior to commencing work.

.3 Connect remote heads to the respective battery unit as indicated on the drawing. Read all notes on the drawings prior to commencing work.

.4 Provide remote heads as specified and as required for compliance with the Ontario Building Code. Install remote heads in the locations as shown on the drawings. Note that in most cases, the proposed location of new heads do not match the location of existing devices. The Contractor must locate remote heads in the new positions as proposed. The Contractor must make allowance for minor revisions to the system, including relocations and re-aiming, as required upon review of the testing results. Generally, all wiring shall be provided in accordance with the Manufacturer's requirements and be minimum No. 10 AWG. The wire size might need to be increased to satisfy voltage drop requirements. Verify voltage drops requirements with the Manufacturer prior to installation.

.5 Prior to installation of any devices, verify the existing conditions around the proposed location and ensure there are no conditions that restrict visibility of exit signs, may affect coverage of emergency lighting, or atmospheric or climate conditions that may affect the operation of new devices (unheated areas, moist/damp air, etc.). Advise the Consultant in writing of all such conditions prior to installation and seek instruction prior to proceeding.

3.2 SITE AIMING

.1 Position and aim adjustable lighting equipment as directed on site and to obtain light levels as required by code. Position outdoor units after daylight hours as directed. Provide labour and materials necessary to accomplish this.

.2 Locate and aim emergency lighting remote heads to optimally illuminate egress route to meet or exceed all code requirements.

3.3 COMPLETION

.1 Fixtures shall be clean and 100% operational at the time of final acceptance.

.2 Upon a complete installation of the systems as proposed on the drawings, as per all code requirements, and to the satisfaction of all Authorities having Jurisdiction, commission and test the new system in entirely with the Manufacturer's Representative. Make allowance for adjustments as required by the Manufacturer or Authorities having Jurisdiction. Provide a letter to the Consultant that the system is complete, has been tested, adjusted (as required), and is in proper operating condition. Testing shall be performed during non-daylight hours.

.3 Upon completion of installation, engage a professional third-party agency to complete an illumination level test throughout all areas of the building where the installation has taken place. The Contractor must work with the third-party agency to properly aim remote light heads, recording light level readings on a record set of floor plans, calculating light level readings, and issuing to the Consultant a letter stating that the emergency lighting levels meet the requirements of the Ontario Building Code. Notify the Owner and Consultant at least ten (10) days prior to the proposed testing and verification data and schedule a time and date that is acceptable to all.

.4 The Contractor is responsible for engaging a professional third-party agency to complete a voltage drop test testing the voltage at each panel as well as the voltage at the most remote fixture.

.5 Include (in the bid price) for the hiring of all third-party agencies (including, but not limited to, the Manufacturer's representative) as required by the drawing and specifications.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED INSTRUCTIONS

.1 Refer to Section 16010 - Electrical General Requirements.

1.2 DESCRIPTION

.1 This section of the specification includes the furnishing, installation, and connection of an intelligent reporting, microprocessor controlled, addressable, fire detection. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and specified herein.

.2 The fire alarm system shall comply with requirements of NFPA Standard 72 and shall be ULC Listed for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

.3 The system shall be an active/interrogative type system where each addressable device is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication as specified hereinafter for the particular input.

.4 Each designated zone shall have ability to transmit separate and different alarm, supervisory and trouble signal.

.5 The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

.6 The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

.7 The testing company shall employ technician certified and approved for fire alarm system testing & verification by Canadian Fire Alarm Association (CFAA) and the Ontario Fire Marshal as applicable.

1.3 SCOPE OF WORK

.1 A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance with the specifications and drawings.

.2 The system shall be sized and wired such that each signaling line circuit (SLC) is limited to only **75% of its total capacity** at initial installation.

.3 Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 6 (CLASS B) Signaling Line Circuits (SLC).

2. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.

3. Notification Appliance Circuits (NAC) shall be wired CLASS B (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.

4. On Style 6 or 7 (CLASS B) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

.4 Basic Systems Functional Operation

1. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

   a. The System Alarm LED shall flash.
   b. A local piezo electric signal in the control panel shall sound.
   c. The 2-line LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
   d. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
   e. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

1.4 SUBMITTALS

.1 General:

1. Six (6) copies of all submittals shall be submitted to the Consultant for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.

.2 Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout, configurations, and terminations.

.3 Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.
4. Approvals will be based on complete submissions of manuals together with shop drawings.

.4 Software Modifications

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

.5 Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.5 WARRANTY:

.1 All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.6 APPROVALS:

.1 The system shall have proper listing and/or approval from the following nationally recognized agencies:

ULC Underwriters Laboratories Canada

.2 The Fire Alarm Control Panel and all transponders shall meet the modular listing requirements of Underwriters Laboratories, Inc. Each subassembly, including all printed circuits, shall include the appropriate UL modular label. This includes all printed circuit board assemblies, power supplies, and enclosure parts. Systems that do not include modular labels may require return to the factory for system upgrades, and are not acceptable.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL:

.1 All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

.2 All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the riser/connection diagram for all specific system installation/termination/wiring data.

.3 All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2 CONDUIT AND WIRING:

.1 Conduit:

1. Conduit shall be in accordance with Ontario Electrical Safety Code (OESC 2015), local and provincial requirements.
2. All wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors.

4. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 1/2 inch (16 mm) minimum.

.2 Wiring

1. All fire alarm system wiring must be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., OESC 2009) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 16 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.63 mm) for notification appliance circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in OBC & Fire Code.
5. The system shall permit the use of IDC and NAC wiring in the same conduit with the multiplex communication loop.
6. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.
7. All analog voice speaker and analog telephone circuits shall use twisted/shielded pair to eliminate cross talk.

.3 Terminal Boxes, Junction Boxes and Cabinets:

1. All boxes and cabinets shall be ULC listed for their intended purpose.

.4 Initiating circuits shall be arranged to serve like categories (manual, smoke). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

.5 The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 15 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

2.3 MAIN FIRE ALARM CONTROL PANEL:

1. Main FACP or network node shall be a NOTIFIER Model NFS-640 and shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

2. Operator Control

    1. Acknowledge Switch:

        .1 Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition.

        .2 Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

    2. Alarm Silence Switch:
        1. Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.
    3. Alarm Activate (Drill) Switch:
        1. The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
    4. System Reset Switch:
        1. Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
    5. Lamp Test:
        1. The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.

3. System Capacity and General Operation
    a. The control panel or each network node shall provide, or be capable of expansion to 636 intelligent/addressable devices.

    b. The control panel or each network node shall include Form-C alarm, trouble, supervisory, and security relays rated at a minimum of 2.0 amps @ 30 VDC. It

shall also include four Class B (NFPA Style Y) or Class A (NFPA Style Z) programmable Notification Appliance Circuits.

c. The control panel or each network node shall support up to 8 additional output modules (signal, speaker, telephone, or relay), each with 8 circuits for an additional 64 circuits. These circuits shall be Class B (NFPA Style Y) per the project drawings.

d. The system shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color coded system status LEDs, and an alphanumeric keypad with easy touch rubber keys for the field programming and control of the fire alarm system.

e. The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.

f. The system shall allow the programming of any input to activate any output or group of outputs. Systems that have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or require a laptop personal computer are not considered suitable substitutes.

4. The FACP shall support up to 20 logic equations, including "and," "or," and "not," or time delay equations to be used for advanced programming. Logic equations shall require the use of a PC with a software utility designed for programming.

a. The FACP or each network node shall provide the following features:

i. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.

ii. Detector sensitivity test, meeting requirements of NFPA 72, Chapter 7.

iii. Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.

iv. Nine sensitivity levels for alarm, selected by detector. The alarm level range shall be .5 to 2.35 percent per foot for photoelectric detectors and 0.5 to 2.5 percent per foot for ionization detectors. The system shall also support sensitive advanced detection laser detectors with an alarm level range of .03 percent per foot to 1.0 percent per foot. The system shall also include up to nine levels of Pre-alarm, selected by detector, to indicate impending alarms to maintenance personnel.

v. The ability to display or print system reports.

vi. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification 20 times.

vii. PAS pre-signal, meeting NFPA 72 3-8.3 requirements.

viii. Rapid manual station reporting (under 3 seconds) and shall meet NFPA 72 Chapter 1 requirements for activation of notification circuits within 10 seconds of initiating device activation.

ix. Periodic detector test, conducted automatically by the software.

x. Self optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its prealarm level to just above normal peaks.
xi. Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
xii. Walk test, with a check for two detectors set to same address.
xiii. Control-by-time for non-fire operations, with holiday schedules.
xiv. Day/night automatic adjustment of detector sensitivity.

5. The FACP shall be capable of coding main panel node notification circuits in March Time (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Panel notification circuits (NAC 1,2,3 and 4) shall also support Two-Stage operation, Canadian Dual Stage (3 minutes) and Canadian Dual Stage (5 minutes). Two stage operation shall allow 20 Pulses Per Minute (PPM) on alarm and 120 PPM after 5 minutes or when a second device activates. Canadian Dual stage is the same as Two-Stage except will only switch to second stage by activation of Drill Switch 3 or 5 minute timer. The panel shall also provide a coding option that will synchronize specific strobe lights designed to accept a specific "sync pulse."

6. Central Microprocessor
   a. The microprocessor shall be a state-of-the-art, high speed, 16-bit RISC device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, Flash memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.
   b. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
   c. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.
   d. A special program check function shall be provided to detect common operator errors.
   e. An auto-program (self-learn) function shall be provided to quickly install initial functions and make the system operational.
   f. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download, and have the ability to upgrade the manufacturers (FLASH) system code changes. This program shall also have a verification utility, which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in incompliance with the NFPA 72 requirements for testing after system modification.

7. System Display
   a. The system shall support the following display mode options:
      1. 80 character display option. The display shall include an 80-character backlit alphanumeric Liquid Crystal Display (LCD) and a full PC style QWERTY keypad.
   b. The display shall provide all the controls and indicators used by the system operator:
      1. The 80-character display shall include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, ALARM ACTIVATE (drill), SYSTEM RESET, and LAMP TEST.
   c. The display shall annunciate status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.

   d. The display shall also provide Light-Emitting Diodes.
      1. The 80-character display shall provide 8 Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM WARNING, SECURITY ALARM, SUPERVISORY SIGNAL, SYSTEM TROUBLE, DISABLED POINTS, and ALARM SILENCED.
      2. The 80-character display keypad shall be an easy to use QWERTY type keypad, similar to a PC keyboard. This shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
      3. The 640-character display shall use 10 "soft" keys for screen navigation or to accomplish dedicated programming functions. Full programming access shall require use of a laptop and the proper programming utility.
   e. The system shall support the display of battery charging current and voltage on the 80-character LCD display.

8. Signaling Line Circuits (SLC)
   a. Each FACP shall support up to two SLCs. Each SLC interface shall provide power to and communicate with up to 159 intelligent detectors (ionization, photoelectric or thermal) and 159 intelligent modules (monitor or control) for a loop capacity of 318 devices. The addition of the optional second loop shall double the device capacity, supporting a total of 636 devices. Each SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A) wiring.
   b. CPU shall receive analog information from all intelligent detectors to be processed to determine whether normal, alarm, prealarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

9. Serial Interfaces
   a. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Information Technology Equipment (ITE) peripherals.
      .1 The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays.
      .2 The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

10. Notification Appliance Circuit (NAC) Module
   a. The Notification Appliance Circuit module shall provide four fully supervised CLASS B. notification circuits. An expansion circuit board shall allow expansion to eight circuits per module.
   b. The notification circuit capacity shall be 3.0 amperes maximum per circuit and 6.0 amperes maximum per module.
   c. The module shall not affect other module circuits in any way during a short circuit condition.
   d. The module shall provide eight green ON/OFF LEDs and eight yellow trouble LEDs.
   e. The module shall also provide a momentary switch per circuit that may be used to manually turn the particular circuit on or off or to disable the circuit.
   f. Each notification circuit shall include a custom label inserted to identify each circuit's location. Labels shall be created using a standard typewriter or word processor.
   g. The notification circuit module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal strips shall be UL listed for use with up to 12 AWG wire.
   h. Each circuit shall be capable of, through system programming, deactivating upon depression of the signal silence switch.

11. Control Relay Module
   a. The control relay module shall provide four Form-C auxiliary relay circuits rated at 5 amperes, 28 VDC. An expansion circuit board shall allow expansion to eight Form-C relays per module.
   b. Each relay circuit shall be capable of being activated (change in state) by any initiating device or from any combination of initiating devices.
   c. The relay module shall provide 8 green ON/OFF LEDs and 8 yellow LEDs (indicates disabled status of the relay).
   d. The module shall provide a momentary switch per relay circuit that may be used to manually turn the relay ON/OFF or to disable the relay.
   e. Each relay circuit shall include a custom label inserted to identify its location. Labels shall be created using a standard typewriter or word processor.
   f. The control relay module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal blocks shall be UL listed for use with up to 12 AWG wire.

12. Voice Control Module (speakers)
    a. The voice control (speaker circuit) module shall provide four fully supervised CLASS B (NFPA Style Z) NAC speaker circuits. An expansion circuit board shall allow expansion for up to eight circuits per module.
    b. Each speaker circuit shall be capable of switching up to 30 watts maximum per circuit or 60 watts per four circuit module.
    c. If a short-circuit trouble occurs on one of the circuits, that circuit will not activate on either manual or automatic command.
    d. The module shall provide green ON/OFF LEDs and yellow TROUBLE LEDs.
    e. The module shall also provide a momentary switch per circuit that may be used to manually turn the particular circuit on or off or to disable the circuit.
    f. Each voice circuit shall include a custom label inserted to identify its location. Labels shall be created using a standard typewriter or word processor.
    g. The voice control module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal strips shall be UL Listed for use with up to 12 AWG wire.
    h. Each speaker circuit module may be programmed to activate on activation of the All-Call switch and to deactivate upon pressing the signal silence switch.

13. Enclosures:
    a. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
    b. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.
    c. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be site configured for either right or left hand hinging.

14. Power Supply:
    a. A high tech off-line switching power supply shall be available for the fire alarm control panel or network node and provide 6.0 amps of available power for the control panel and peripheral devices.
    b. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
    c. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger for use with batteries up to 60 AH or may be used with an external battery and charger system. Battery arrangement may be configured in the field.
    d. The power supply shall continuously monitor all field wires for earth ground conditions, and shall have the following LED indicators:
        a. Ground Fault LED
        b. AC Power Fail LED
        c. NAC on LED (4)
    e. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.

f. The main power supply shall provide a battery charger using dual-rate charging techniques for fast battery recharge and be capable of charging batteries up to 60 AH.
g. All circuits shall be power-limited, per UL864 requirements.

15. Field Charging Power Supply (FCPS): The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.
    a. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.
    b. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
    c. The FCPS shall include an attractive surface mount backbox.
    d. The Field Charging Power Supply shall include the ability to delay the AC fail delay per NFPA requirements.
    e. The FCPS include power limited circuitry, per 1995 UL standards.

16. Audio Amplifiers:
    a. The audio amplifiers will provide audio power (@ 25 Volts RMS) for distribution to the speaker circuits.
    b. Multiple audio amplifiers may be mounted in the fire alarm control panel using additional cabinets if necessary.
    c. The audio amplifiers shall include an integral power supply, and shall provide the following controls and indicators:

        a. Normal Audio Level LED
        b. Incorrect Audio Level LED
        c. Brownout LED
        d. Battery Trouble LED
        e. Amplifier Trouble LED
        f. Audio Amplifier Gain Adjust

    d. Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.
    e. All terminal blocks for the connection of field wiring shall have a removable plug-in and be hardwired to allow for ease of field wire installation in a cabinet or at a remote location.
    f. The amplifier shall include audio input and amplified output supervision, back up input, and automatic switchover to back up (if primary amplifier should fail).
    g. Amplifiers shall be backed up in groups (one amplifier backs up several primary amplifiers).

17. Specific System Operations
    a. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the

system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.

b. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 5 to 30 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

c. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.

d. Point Read: The system shall be able to display the following point status diagnostic functions:

   i. Device status
   ii. Device type
   iii. Custom device label
   iv. View analog detector values
   v. Device zone assignments
   vi. All program parameters

e. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 800 events. Up to 200 events shall be dedicated to alarm and the remaining events are general purpose. Systems that do not have dedicated alarm storage, where events are overridden by non-alarm type events, are not suitable substitutes. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.

f. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

g. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.

h. Software Zones: The FACP shall provide 100 software zones, 10 additional special function zones, 10 releasing zones, and 20 logic zones.

i. The fire alarm control panel shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without returning to the panel to reset the system. Operation shall be as follows:
   i. Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test, for 3 seconds.
   ii. Introducing a trouble into the initiating device shall activate the programmed outputs for 8 seconds.
   iii. All devices tested in walk test shall be recorded in the history buffer.

j. Waterflow Operation
   1. An alarm from a waterflow detection device shall activate the appropriate alarm message on the main panel display, turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.

k. Supervisory Operation
   1. An alarm from a supervisory device shall cause the appropriate indication on the system display, light a common supervisory LED, but will not cause the system to enter the trouble mode.

l. Signal Silence Operation
   1. The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.

m. Non-Alarm Input Operation
   1. Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.

n. Combo Zone
   1. A special type code shall be available to allow waterflow and supervisory devices to share a common addressable module. Waterflow devices shall be wired in parallel, supervisory devices in series.

2.4 SYSTEM COMPONENTS-SIGNAL DEVICES:

.1 All audible and visual signal devices shall be UL listed and labeled as such.

.2 In finished areas, the speakers and strobe signal devices shall be installed in recessed backbox where feasible. Where recessing of backboxes is not feasible provide surface mounted red finish backbox with no knockouts.

.3 In finished areas, audible signal device shall consist of cone speaker with sound output of 90dBA at 10 feet tapped at 2 watts, 25/70volt operation with ¼, ½, 1 and 2 watts taps, suitable for mounting on wall mounted backbox, square red grille. Strobe shall be synchronized with field selectable illumination of 15/30/75/110 cd using xenon flashing tube under lexan lens with “FIRE” marking. Devices shall be System Sensor #SPRVA (Speaker) & SPSRVA (Speaker Strobe). Ensure synchronization compatibility with control panel. Provide wall mount backbox skirt #SPBBS.

.4 In Utility Rooms such as Mechanical Rooms etc. units shall be heavy duty construction consisting of sealed high compression driver with high dB output upto 90dBA @10 feet 10 feet tapped at 2 watts, 25/70volt operation with ¼, ½, 1 and 2 watts taps, suitable for

mounting on wall mounted backbox, square red grille. Unit installed in non-climate controlled environment shall be c/w weatherproof boxes. Devices shall be System Sensor #SPRVA (Speaker) & SPSRVA (Speaker Strobe). Ensure synchronization compatibility with control panel. Provide wall mount backbox skirt #SPBBS.

.5 Provide suitable synchronizing module to suit signaling requirements. These synchronizing modules shall be installed in separate enclosure outside of the panel tub.

2.5. SYSTEM COMPONENTS - ADDRESSABLE DEVICES

.1 Addressable Devices - General

1. Addressable devices shall provide an address-setting means using rotary decimal switches.
2. Addressable devices shall use simple to install and maintain decade (numbered 0 to 9) type address switches. Devices which use a binary address or special tools for setting the device address, such as a dip switch are not an allowable substitute.
3. Detectors shall be Analog and Addressable, and shall connect to the fire alarm control panel's Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual (2) status LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs can be programmed off via the fire control panel program.
5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity can be automatically adjusted by the panel on a time-of-day basis.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
7. The detectors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature.
8. The following bases and auxiliary functions shall be available:
   a. Sounder base rated at 85 DBA minimum.
   b. Form-C Relay base rated 30VDC, 2.0A
   c. isolator base
9. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (example: ION, PHOTO, THERMAL).

.2 Addressable Manual Fire Alarm Box (manual station)

1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

.3 Reserved.

.4 Intelligent Photoelectric Smoke Detector

1. The detectors shall use the dual-chamber photoelectric principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

.5 Intelligent Thermal Detectors

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

.6 Intelligent Duct Smoke Detector

1. The smoke detector housing shall accommodate either an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

.7 Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
2. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

.8 Two Wire Detector Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. The IDC zone may be wired for Class A operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

.9 Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances.
2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation.
3. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.
4. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

.10 Addressable Relay Module

1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

.11 Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

3. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

.12 Serially Connected Annunciator Requirements

1. The annunciator shall communicate to the fire alarm control panel via an EIA 485 (multi-drop) two-wire communications loop. The system shall support two 6,000 ft. EIA-485 wire runs. Up to 32 annunciators, each configured up to 96 points, may be connected to the connection, for a system capacity of 3,072 points of annunciation.
2. An EIA-485 repeater shall be available to extend the EIA-485 wire distance in 3,000 ft. increments. An optional version shall allow the EIA-485 circuit to be transmitted over Fiber optics. The repeater shall be UL864 approved.
3. Each annunciator shall provide up to 96 alarm and 97 trouble indications using a long-life programmable color LED's. Up to 96 control switches shall also be available for the control of Fire Alarm Control Panel functions. The annunciator will also have an "ON-LINE" LED, local piezo sounder, local acknowledge and lamp test switch, and custom zone/function identification labels.
4. The annunciator may be field configured to operate as a "Fan Control Annunciator". When configured as "Fan Control," the annunciator may be used to manually control fan or damper operation and can be set to override automatic commands to all fans/dampers programmed to the annunciator.
5. Annunciator switches may be programmed for System control such as, Global Acknowledge, Global Signal Silence, Global System Reset, and on/off control of any control point in the system.
6. An optional module shall be available to utilize annunciator points to drive EIA-485 driven relays. This shall extend the system point capacity by 3,072 remote contacts.
7. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.
8. Provide colored passive graphics showing each zone in different color and labels with zone description. All stairs shall be colored yellow. “YOU ARE HERE” wording shall be red in color. Minimum of six (6) colors shall be used.

2.6 BATTERIES AND EXTERNAL CHARGER:

.1 Battery:

1. Shall be 12 volt, Gell-Cell type.
2. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

.2 External Battery Charger:

1. Shall be completely automatic, with constant potential charger maintaining the battery fully charged under all service conditions. Charger shall operate from a 120/240-volt 50/60 hertz source.
2. Shall be rated for fully charging a completely discharged battery within 48 hours while simultaneously supplying any loads connected to the battery.
3. Shall have protection to prevent discharge through the charger.
4. Shall have protection for overloads and short circuits on both AC and DC sides.

PART 3 - EXECUTION

3.1. INSTALLATION:

.1 Installation shall be in accordance with the OESC (Ontario Electrical Safety Code), OBC (Ontario Building Code), CAN/ULC-S524 and local codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

.2 All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

.3 All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

.4 Manual Pull Stations shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 47 inches above the finished floor.

3.2 TYPICAL OPERATION:

.1 Actuation of any manual station, smoke detector or heat detector shall cause the following operations to occur unless otherwise specified:

1. Activate all programmed speaker circuits.
2. Actuate all strobe units until the panel is reset.
3. Light the associated indicators corresponding to active speaker circuits.
4. Release all magnetic door holders to doors to adjacent zones on the floor from that the alarm was initiated.
5. Duct type smoke detectors shall, in addition to the above functions shut down the ventilation system or close associated control dampers as appropriate.

3.3 TEST:

.1 Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. Verification shall be done by CFAA certified technician(s) and in accordance with CAN/ULC-S537 standards and local authorities requirements.

.2 Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

.3 Open initiating device circuits and verify that the trouble signal actuates.

.4 Open signaling line circuits and verify that the trouble signal actuates.

.5 Open and short notification appliance circuits and verify that trouble signal actuates.

.6 Ground initiating device circuits and verify response of trouble signals.

.7 Ground signaling line circuits and verify response of trouble signals.

.8 Ground notification appliance circuits and verify response of trouble signals.

.9 Check presence and audibility of tone at all alarm notification devices.

.10 Check installation, supervision, and operation of all intelligent smoke detectors during a walk test.

.11 Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

.12 When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

.13 Include for audibility levels testing and plotting readings on complete floor plan for records and local authorities requirements. Include for tap adjustment as required to achieve optimum code required audibility.

3.4 FINAL INSPECTION:

.1 At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

.2 Consultant will apply and obtain building permit on owner’s behalf. The successful contractor shall be responsible for arranging final inspection by the building and fire department at the end of project and include for all time, material & services required to obtain final approval from authorities having final jurisdiction.

3.5 INSTRUCTIONS:

.1 Provide instructions as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

.2 The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION