

TENDER DOCUMENTS & SPECIFICATIONS

**TALOYOAK RCMP DETACHMENT
FIRE ALARM SYSTEMS UPGRADE**

TALOYOAK, NU

RCMP IO#: 1005448, 2017

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Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises renovation of the RCMP Detachment, located at Taloyoak, NU; and further identified as the Taloyoak RCMP Detachment Fire Alarm System Upgrade.
- .2 Work of Project executed during Work of this Contract, and which is specifically included in this Contract:
 - .1 Fire Alarm Control system Replacement with addressable FACP.

1.2 WORK SEQUENCE

- .1 Construct Work to be intermittent, as premises will be occupied during construction.
- .2 Co-ordinate Progress Schedule with Project Manager / Engineer during construction.
- .3 Maintain fire access/control.
- .4 Work completion date will be coordinated with Project Manager / Engineer.

1.3 CONTRACTOR USE OF PREMISES

- .1 Limit use of premises for Work, and for access, to allow:
 - .1 Work by other contractors.
- .2 Co-ordinate use of premises under direction of Project Manager / Engineer.
- .3 Confirm with client whether storage is available on site. Otherwise obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Project Manager / Engineer.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.4 TENANT OCCUPANCY

- .1 Premises will be occupied during entire construction period for execution of normal operations.

1.5 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations, occupants, and normal use of premises. Arrange with Project Manager / Engineer to facilitate execution of work.

1.6 EXISTING SERVICES

- .1 Notify client of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Project Manager / Engineer two weeks notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify Project Manager / Engineer of findings.
- .4 Submit schedule to and obtain approval from Project Manager / Engineer for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .5 Provide temporary services to maintain critical building and tenant systems.
- .6 Where unknown services are encountered, immediately advise client and confirm findings in writing.
- .7 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .8 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.7 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Shop Drawings.
 - .5 Change Orders.
 - .6 Other Modifications to Contract.
 - .7 Field Test Reports.
 - .8 Copy of Approved Work Schedule.
 - .9 Health and Safety Plan and Other Safety Related Documents as specified.

END OF SECTION

Part 1 General

1.1 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Project Manager / Engineer to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Project Manager / Engineer will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Closures: protect work temporarily until permanent enclosures are completed.

1.2 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations, occupants, and normal use of premises. Arrange with Project Manager / Engineer to facilitate execution of work.
- .2 Obtain approval from Project Manager / Engineer 24 hours prior to demolition of any existing items that are not listed within this Contract.

1.3 SPECIAL REQUIREMENTS

- .1 Submit schedule in accordance with Section 01 32 18 - Construction Progress Schedules.
- .2 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3 Keep within limits of work and avenues of ingress and egress.

1.4 SECURITY CLEARANCES

- .1 All personnel that will require entry to the premises must have FA-2 clearance. Contractor to ensure acquiring FA-2 security clearance, prior to start of any activity, of all working personnel accessing the work area.
- .2 Contractor access to site will be supervised during construction.
- .3 Contractor is to provide fire watch during any system downtime as required.
- .4 Windows, work area and tools to be secured each day at conclusion of work for that day.
- .5 Removal and storage of demolition materials to be coordinated with engineer to ensure site security is maintained.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 Milestone: significant event in project, usually completion of major deliverable.
- .2 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .3 Project Planning, Monitoring and Control System: overall system operated by Engineer to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

- .1 Plan to complete Work in accordance with prescribed milestones and time frame. See Section 01 32 18 item 1.5.2.
- .2 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Project Manager / Engineer within 15 working days of Award of Project Schedule for planning, monitoring and reporting of project progress.

1.4 PROJECT MILESTONES

- .1 Project milestones form interim targets for Project Schedule.
 - .1 Interior finishing and fitting and electrical work start and finish dates.
 - .2 Interim Certificate of Completion.

1.5 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.

- .5 Electrical.
- .6 Controls.
- .7 Millwork.
- .8 Fire Systems.
- .9 Testing and Commissioning.
- .10 Supplied equipment long delivery items.
- .11 Engineer supplied equipment required dates
- .12 Red line and as-built drawings.

1.6 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on monthly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.7 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Submit to Engineer submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable. Review submittals prior to submission to Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .5 Notify Project Manager/Engineer in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6 Verify field measurements and affected adjacent Work are co-ordinated.
- .7 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.
- .8 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer review.
- .9 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3 Allow 15 days for Engineer's review of each submission.

- .4 Adjustments made on shop drawings by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- .5 Make changes in shop drawings as Engineer may require, consistent with Contract Documents. When resubmitting, notify Engineer in writing of revisions other than those requested.
- .6 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .7 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier & Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .8 After Engineer's review, distribute copies.
- .9 Submit 5 prints of shop drawings for each requirement requested in specification Sections and as Engineer may reasonably request.
- .10 Submit 5 copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Engineer where shop drawings will not be prepared due to standardized manufacture of product.

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- .11 Submit 5 copies of test reports for requirements requested in specification Sections and as requested Engineer.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
 - .12 Submit 5 copies of certificates for requirements requested in specification Sections and as requested by Engineer.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
 - .13 Submit 5 copies of manufacturers instructions for requirements requested in specification Sections and as requested by Engineer.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
 - .14 Submit 5 copies of Operation and Maintenance Data including fire alarm VI report, as built record drawings in electronic format and hard copy for requirements requested in specification Sections and as requested by Engineer.
 - .15 Delete information not applicable to project.
 - .16 Supplement standard information to provide details applicable to project.
 - .17 If upon review by Engineer, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.3 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

END OF SECTION

Part 1 General

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code of Canada (NBC) including amendments up to tender closing date and other requirements of Authorities Having Jurisdiction provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.
- .3 Human Resources and Social Development Canada – Fire Protection Services
- .4 Treasury Board – Chapter 3-4 Standard for Fire Alarm Systems
- .5 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 Safety Act, R.S.N.W.T.

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit copies of reports or directions issued by Authorities Having Jurisdiction
- .3 Submit copies of incident and accident reports.
- .4 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, territorial and local statutes, regulations, and ordinances, and with any site-specific Health and Safety requirements.

1.4 COMPLIANCE REQUIREMENTS

- .1 Comply with Safety Act, General Safety Regulations, R.R.N.W.T.
- .2 Comply with Occupational Health and Safety Regulations, 1996.

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- .3 Comply with Occupational Health and Safety Act, General Safety Regulations, O.I.C.
 - .4 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.
 - .5 Comply with requirements of Authorities Having Jurisdiction.

1.5 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Territory having jurisdiction and advise Engineer verbally and in writing.

END OF SECTION

Part 1 General

1.1 INSPECTION

- .1 Allow Engineer access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Project Manager / Engineer instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Project Manager / Engineer will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Engineer shall pay cost of examination and replacement.

1.2 ACCESS TO WORK

- .1 Allow engineer accesses to Work, off site manufacturing and fabrication plants if required.
- .2 Co-operate to provide reasonable facilities for such access.

1.3 PROCEDURES

- .1 Notify appropriate Project Manager / Engineer in advance of requirement for tests, in order that attendance arrangements can be made.

1.4 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Project Manager / Engineer as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Project Manager / Engineer it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Project Manager / Engineer will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Engineer.

1.5 REPORTS

- .1 Submit 5 copies of inspection and test reports to owner.
- .2 Provide copies to subcontractor of work being inspected or tested.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.2 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.3 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.2 INSTALLATION AND REMOVAL

- .1 Indicate use of supplemental or other staging area.
- .2 Provide construction facilities in order to execute work expeditiously.
- .3 Remove from site all such work after use.

1.3 SITE STORAGE/LOADING

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.4 CONSTRUCTION PARKING

- .1 Parking will be permitted on site in designated areas.
- .2 Provide and maintain adequate access to project site.

1.5 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Locate materials on site in manner to cause least interference with work activities.

1.6 SANITARY FACILITIES

- .1 The Project Manager / Engineer will provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.7 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Store materials resulting from demolition activities that are salvageable.
- .3 Stack stored new or salvaged material not in construction facilities.

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

1.2 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around open shafts, open stairwells, and open edges of floors and roofs.
- .2 Provide as required by governing authorities.

1.3 DUST TIGHT SCREENS

- .1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.

1.4 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.5 PROTECTION OF BUILDING FINISHES

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens and covers.
- .3 Confirm with Project Manager / Engineer locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 If there is question as to whether products or systems are in conformance with applicable standards, Project Manager / Engineer reserves right to have such products or systems tested to prove or disprove conformance.
- .2 Cost for such testing will be born by Project Manager in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .3 Conform to latest date of issue of referenced standards in effect except where specific date or issue is specifically noted.

1.2 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .4 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Project Manager / Engineer of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Project Manager / Engineer at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Project Manager / Engineer reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

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- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
 - .3 Store products subject to damage from weather in weatherproof enclosures.
 - .4 Store cementitious products clear of earth or concrete floors, and away from walls.
 - .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
 - .6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
 - .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
 - .8 Remove and replace damaged products at own expense and to satisfaction of Engineer.
 - .9 Touch-up damaged factory finished surfaces to Project Manager / Engineer's satisfaction. Use touch-up materials to match original. Do not paint over nameplates.

1.5 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Project Manager / Engineer in writing, of conflicts between specifications and manufacturer's instructions, so that PM or Engineer will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Engineer to require removal and re-installation at no increase in Contract Price or Contract Time.
- .4 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Engineer if required Work is such as to make it impractical to produce required results.
- .5 Do not employ anyone unskilled in their required duties. Engineer reserves right to require dismissal from site, workers deemed incompetent or careless.
- .6 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Project Manager, whose decision is final.

1.6 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.7 CONCEALMENT

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Project Manger / Engineer if there is interference. Install as directed by Engineer.

1.8 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.9 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Project Manager / Engineer of conflicting installation. Install as directed.

1.10 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.11 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.12 PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated, without written approval of Project Manager / Engineer.

END OF SECTION

Part 1 General

1.1 EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Project Manager / Engineer of findings.

1.2 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Project Manager / Engineer of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Project Manager / Engineer.

1.3 RECORDS

- .1 Maintain a complete, accurate log of control as it progresses.
- .2 Record locations of maintained, re-routed and abandoned service lines.

END OF SECTION

Division 1 General

1.1 SECTION INCLUDES

- .1 Text and procedures for systematic Waste Management for construction, deconstruction, demolition, and renovation projects, including:
 - .1 Materials Source Separation Program (MSSP).
 - .2 Diversion of Materials.

1.2 PRECEDENCE

- .1 For this project, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 DEFINITIONS

- .1 Demolition Waste Audit (DWA): Relates to actual waste generated from project.
- .2 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .3 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.
- .4 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .5 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .6 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .7 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .8 Separate Condition: Refers to waste sorted into individual types.
- .9 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.
- .10 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities.

1.4 QUALITY ASSURANCE - SITE VISIT

- .1 Pre-tender meeting:
 - .1 Date, time and location to be arranged by Project Manager.

1.5 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

- .1 Prepare MSSP and have ready for use prior to project start-up.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Project Manager / Engineer. Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .3 Provide containers to deposit reusable and recyclable materials.
- .4 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .5 Locate separated materials in areas, which minimize material damage.
- .6 Collect, handle, store on-site, and transport off-site, salvaged materials.

1.6 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Engineer.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to disposal facility.
- .5 Protect structural components not removed for demolition from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Project Manager / Engineer.
- .7 Separate and store materials produced during dismantling of structures in designated areas.
- .8 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by receiving facilities.

1.7 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, and paint thinner into waterways, storm, or sanitary sewers.

- .3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

1.8 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by existing facility.

1.9 SCHEDULING

- .1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

Division 2 Execution

1.10 APPLICATION

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

1.11 CLEANING

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

1.12 DIVERSION OF MATERIALS

- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Project Manager / Engineer and consistent with applicable fire regulations.
 - .1 Mark containers or stockpile areas.
 - .2 Provide instruction on disposal practices.
- .2 On-site sale of salvaged, recovered, reusable, recyclable materials is not permitted.
- .3 Demolition Waste

Material Type	Recommended Diversion %	Actual Diversion %
Acoustic Tile	50	<input type="text"/>
Acoustical Insulation	100	<input type="text"/>
Carpet	100	<input type="text"/>
De-mountable Partitions	80	<input type="text"/>
Doors and Frames	100	<input type="text"/>
Electrical Equipment	80	<input type="text"/>
Furnishings	80	<input type="text"/>
Mechanical Equipment	100	<input type="text"/>

Material Type	Recommended Diversion %	Actual Diversion %
Metals	100	<input type="text"/>
Rubble	100	<input type="text"/>
Wood (uncontaminated)	100	<input type="text"/>
Other		<input type="text"/>

.4 Construction Waste

Material Type	Recommended Diversion %	Actual Diversion %
Cardboard	100	<input type="text"/>
Plastic Packaging	100	<input type="text"/>
Rubble	100	<input type="text"/>
Steel	100	<input type="text"/>
Wood (uncontaminated)	100	<input type="text"/>
Other		<input type="text"/>

END OF SECTION

1. GENERAL CONDITIONS

- .1 This section covers items common to all sections of Division 26 & 28. This section supplements the requirements of Division 1.
- .2 The Contractor shall read and be governed by the General Conditions, General Instructions, Instructions to Bidders, Addenda, Form of Tender, and Agreement of the complete specifications for this project.
- .3 The complete work under his trade shall be governed by the dictates of good practice in all details of materials and methods, even if not minutely specified. The work shall be properly coordinated with the requirements of other units of work specified in other sections.

2. CODES AND STANDARDS

- .1 Perform complete installation in accordance with CSA C22.1-12, Canadian Electrical Code, Part I, except where specified otherwise.
- .2 Perform complete installation in accordance with the National Building Code of Canada, except where specified otherwise.
- .3 Installation and equipment standards are to be manufactured or installed to the more stringent requirements of the above standards, or the drawings and specifications.

3. SCOPE OF WORK

- .1 The work shall include but not be limited to the following:
 - .1 Provide a complete supervised fire alarm system including pull stations, bell/strobes, annunciator/control panel, detectors, conduit, wire, & boxes.
 - .2 Complete testing and training as outlined in the specifications.
 - .3 Provide 5 copies of Operation and Maintenance materials for both systems as outlined in the specifications Section 01 33 00.
 - .4 Provide as built record drawings in electronic format and hard copy for both systems as outlined in the specifications Section 01 33 00.

4. CARE, OPERATION, AND START-UP

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

- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise verification of fire alarm system. Check, adjust, balance, and calibrate components as necessary.

5. VOLTAGE RATINGS

- .1 Operating voltages: To CAN3-C235-83.
- .2 Control and monitor equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Operate equipment in extreme operating conditions established in above standard without damage to equipment.

6. PERMITS, FEES AND INSPECTIONS

- .1 Pay associated fees and inspections.
- .2 Consultant will provide drawings and specifications required by GNWT at no cost.
- .3 Notify Consultant of changes required by GNWT prior to making changes.
- .4 Furnish Certificates of Acceptance from GNWT and authorities having jurisdiction on completion of work to Engineer.

7. MATERIALS AND EQUIPMENT

- .1 Factory assembled control panels and component.
- .2 All equipment shall be CSA certified to CSA C22.2-12, Canadian Electrical Code, Part II. Where equipment is not CSA certified, special approval must be obtained from the CSA Special Inspections Department. Alternate safety agency certifications will only be accepted with the Engineer and CSA approval.

8. REQUESTS FOR ALTERNATE PRODUCT APPROVALS

- .1 Requests for alternate product approvals will be accepted until ten (10) days prior to closing date, and must be complete submissions containing the required information identified below. Submissions that do not contain the specified documents will be rejected at the outset, and must be re-submitted within the time allotted and with the correct information prior to the stipulated date in order to be considered. Notification of approved equivalents will only be made by formal addenda.

- .2 Requests shall contain, as a minimum, the following information:
 - .1 A clear and concise statement that indicates that the products submitted as equals or equivalents meet or exceed the standards put forth by the specified products technically, aesthetically, and in every other regard.
 - .2 A summary table that lists the proposed equivalent products directly adjacent to the products specified. The table is to include Consultant's equipment type, manufacturer's model number and product type, and shall relate directly to the technical data sheets noted below.
 - .3 A clear and legible facsimile or original copy of the products technical data sheet(s) which indicates all relevant information, and shall consist of complete data. Technical data sheets are to include Consultant's equipment type, complete dimensions, construction detail and materials, description and plan of mounting details, accessories, and wiring details.

9. FINISHES

- .1 Shop finishes metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two (2) coats of finish enamel.
- .2 Paint outdoor electrical enclosures ANSI 61 light grey.
- .3 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

Clean and prime exposed non-galvanized hangers, racks, and fastenings to prevent rusting.

10. EQUIPMENT IDENTIFICATION

- .1 Identify all electrical equipment with nameplates. Type B and C nameplates are to be lamacoid 3 mm thick plastic engraving sheet, black face, white core. Mechanically attach Types B with self-tapping screws. Screws shall be corrosion resistant (brassed or stainless) to prevent premature failure. Where screws penetrate into a live area of the cabinet, the exposed ends shall be suitably protected with rubberized tape. Screws shall not obscure lettering. Type C nameplate lamacoids to be adhesive backed. Type D nameplate to be adhesive labels.

- .1 Nameplate Sizes

Type B	6.0 mm letter height
Type C	3.0 mm letter height
Type D	3.0 mm letter height

- .2 **Wording on nameplates to be approved by Engineer prior to manufacture. Submit typewritten list.**
- .3 Identification language to be English.
- .4 Mechanically fasten all lamacoids in service area.
- .5 Nameplate for Terminal Cabinets: Type B, indicate equipment controlled and voltage.
- .6 Nameplate for Junction Boxes and Pull Boxes: Type D, indicate circuit and panel designation.
- .7 Fire Alarm Devices: Type C, indicate zone number. Includes pull stations, bells, end-of-line resistors, detectors, etc.

11. WIRING IDENTIFICATION

- .1 Colour Code: To CSA C22.1-12.
- .2 Use colour coded wires, matched throughout system.
- .3 Identify both ends of all feeders, branch circuit wiring, control wiring, and systems wiring with permanent, indelible, numbered markings. "Clip-on" wire markers are not acceptable.

12. CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes, and metallic sheathed cables where they are accessible.
- .2 Paint all junction boxes, pull boxes, and covers in accordance with the colour schedule.
- .3 Code with well fastened plastic tape at points where conduit or cable enters wall, ceiling, or floor, and at 5 m intervals.
- .4 Colour Schedule: Identify boxes and conduits with a 30 mm wide prime colour strip within (if applicable) a 200 mm wide auxiliary colour strip.

	<u>Prime</u>	<u>Auxiliary</u>
Fire Alarm	Red	
Normal Power 120, 208, 240V	Grey	

13. WIRING TERMINATIONS

- .1 Lugs, terminals, and screws used for termination of wiring to be suitable for both copper and aluminum conductors, unless special approval has been obtained from the Engineer.

14. MANUFACTURERS AND CSA LABELS

All CSA and manufacturers labels to be visible and legible after equipment is installed.

15. WARNING SIGNS

- .1 As specified, and to meet requirements of Electrical Inspection Department and Engineer.
- .2 Decal signs, minimum size 175 x 250 mm.

16. MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centre-line of equipment, unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise:
 - .1 Fire Alarm Pull Stations: 1200 mm.
 - .2 End-of-Line Resistors: 1500 mm.
 - .3 Fire Alarm Bells And Visual Devices: 2450 mm.

17. ACCESS PANELS

- .1 The Electrical Contractor is to avoid the placement of any new electrical devices or conduit systems that may require access (such as junction boxes) within false or suspended ceilings or walls, and is required to review the architectural drawings obtained from the client for false or suspended ceilings or walls prior to the installation of any electrical component.

- .2 Latched access panels in false or suspended ceilings or walls, required by CSA C22.1-09 (Canadian Electrical Code) for access to any electrical equipment, such as but not limited to junction boxes, conduits, outlet boxes, etc. are to be provided and installed by the Electrical Contractor as part of their scope of work. The Electrical Contractor will be responsible for determining the necessary FRR (Fire Resistance Rating) as determined and set out by NBC 2010.

18. SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- .1 Submit shop drawings and product data as indicated herein.
- .2 Indicate details of construction, dimensions, capacities, weights, and electrical performance characteristics of equipment or material.
- .3 Where applicable, include wiring, single line, and schematic diagrams.
- .4 Include wiring drawings and diagrams showing interconnection with work of other sections.
- .5 Submit original drawings or good quality copies. Fax copies or poor quality copies are not acceptable.
- .6 Each shop drawing submission is to be provided with a blank cover sheet. Cover sheet is to indicate Project Name, Contractor Name, System Name, and Specification Section Number.
- .7 Submit each system's shop drawings in order, and in the appropriate number of copies. Multiple identical copies should not be grouped together but separated by paper clips into system groups.
- .8 Catalogue sheets are acceptable for some materials. Suitably identify the component or equipment to be provided.

19. CERTIFICATE OF ACCEPTANCE

- .1 Furnish a Certificate of Acceptance from Inspection Department prior to application for final inspection by the Engineer.

20. RECORD DRAWINGS

- .1 Keep complete record of electrical systems installed.
- .2 Provide as built record drawings in hard copy.

21. PAYMENT

- .1 Measurement and payment for the work of this division shall be in accordance with the General Conditions, and shall be on a lump sum basis for labour and material portions of this work. Lump sums shall include all labour, equipment, and related costs to install and carry out the work as set out in this division.
- .2 Submit labour and materials breakdown as required for the schedule of values. Breakdowns are to be split into system costs which are to be all inclusive, and support the complete installation for that system. Provide the following breakdown:
 - .1 Itemized service cash allowances.
 - .2 Fire Alarm System, including conduit, fittings, wire, and testing: Section 28 31 01.
 - .3 Bonding, permits, miscellaneous, etc.

22. OPERATION AND MAINTENANCE MANUALS

- .1 Provide operation and maintenance data, instruction, and descriptions for incorporation into 3 ring binder maintenance manual and particular requirements of each section and as specified herein.
- .2 Provide original, **approved shop drawings**. Tabulate according to type of system, as listed in part 23.5.
- .3 Provide typewritten **system descriptions** for each system installed in the facility. Provide step-by-step **operating procedures** sufficient to enable the building operators to remedy simple faults should a system failure occur, and include summaries of manufacturer's system descriptions. Tabulate according to type of system, as listed in part 23.5.
- .4 Provide typewritten **maintenance instructions** for each system installed in the facility. Provide instructions in step-by-step format. Tabulate according to type of system, as listed in part 23.5.
- .5 Operation & Maintenance Manual sections to be as follows:

Main Tab: "ELECTRICAL"
Sub-Tabs: "1.0 GENERAL"
Items Included:

General description of the electrical portion of the entire facility. Description of the layout of the O&M manual. Names, addresses, and phone numbers of Suppliers, Contractors, and Engineers.

“2.0 FIRE ALARM SYSTEM”.

Items Included:

All equipment relating to the Fire alarm system.

“3.0 RECORD DRAWINGS”

Insert record drawings in reduced format. Drawings shall be legible in reduced state.

“4.0 CERTIFICATIONS AND WARRANTIES”

Items Included:

Certificates of inspection, and fire alarm verification sheets and verification certificate. Contractor’s warrantee.

All sections are to be divided by colour coded, permanent, plastic coated typeset dividers.

END OF SECTION

1. GENERAL

1.1 REFERENCES

- .1 CSA C22.2 No. 65-93 Wire Connectors.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings as required.

2. PRODUCTS

2.1 MATERIALS

- .1 Provide pressure type wire connectors with current carrying parts of copper, sized to fit copper or aluminum conductors as required.
- .2 Fixture type splicing connectors with current carrying parts of copper, sized to fit copper conductors #10 AWG or less.

3. EXECUTION

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Install mechanical pressure type connectors. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65.
 - .2 Install fixture type connectors and tighten. Replace insulating cap.

END OF SECTION

1. GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit product data as required.

2. PRODUCTS

2.1 SYSTEM CABLES

- .1 To system manufacturer's requirements, and as indicated in other sections.
- .2 To CSA C22.1-12 requirements.

3. EXECUTION

3.1 INSTALLATION OF SYSTEM CABLES

- .1 Reuse existing conduit for all Fire Alarm devices, where possible. Provide new conduit for new devices.
- .2 Install new Fire Alarm system cable/wiring in conduit for all devices.

END OF SECTION

1. GENERAL

1.1 RELATED SECTIONS

- .1 This section is related to all sections indicated in the Division 26 & 28.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings as required.

2. PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- .1 Burndy.
- .2 Thomas & Betts.

2.2 EQUIPMENT

- .1 All grounding components to be high conductivity copper alloy with high conductivity bronze alloy hardware.
- .2 System, circuit, and equipment grounding conductors, bare stranded copper, soft annealed, size as indicated or required by Canadian Electrical Code.
- .3 Insulated grounding conductors with green insulation.
- .4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Bonding jumpers, straps.
 - .5 Pressure wire connectors.

3. EXECUTION

3.1 INSTALLATION GENERAL

- .1 Conform to CSA C22.1-12.

-
- .2 Install complete, permanent, and continuous system, circuit, and equipment grounding systems including conductors, connectors, and accessories as indicated, to conform to requirements of Engineer, and local authority having jurisdiction over installation.
 - .3 Install connectors in accordance with manufacturer's instructions.
 - .4 Protect exposed grounding conductors from mechanical injury.
 - .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
 - .6 Soldered joints not permitted.
 - .7 Install separate ground conductor in all underground ducts, and all conduits having "PVC" as part of run.
 - .8 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
 - .9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

3.2 SYSTEM AND CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral of secondary 120/208 V system.

3.3 EQUIPMENT GROUNDING AND BONDING

- .1 Install grounding and bonding connections to typical equipment including but not necessarily limited to the following list:
 - .1 Frames, Fire Alarm system.

3.4 FIELD QUALITY CONTROL

- .1 Perform ground continuity and resistance tests using method appropriate to site conditions, and to approval of Engineer and local authority having jurisdiction over installation.
- .2 Perform tests before energizing electrical system.

END OF SECTION

1. PRODUCTS

1.1 SUPPORT CHANNELS

- .1 U-shape (Powerstrut, Cantruss, Unistrut, etc.), size 1 $\frac{5}{8}$ " x 1 $\frac{5}{8}$ ", 12 gauge, surface mounted or suspended.

2. EXECUTION

2.1 INSTALLATION

- .1 Secure surface mounted equipment with twist clip fasteners to inverted T-bar ceilings. Ensure that T-bars are adequately supported to carry weight of equipment specified before installation.
- .2 Support equipment, conduit, or cables using clips, spring-loaded nuts, and cable clamps designed as accessories to basic channel members.
- .3 Fasten exposed conduit or cables to building construction or support system using straps as follows:
- .1 One hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .4 Suspended Support Systems:
- .1 Support individual cable or conduit runs with 13 mm diameter threaded rods and spring clips.
 - .2 Support two or more cables or conduits on channels supported by 13 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .5 For surface mounting of two or more conduits, use channels at 1.5 m O.C. spacing.
- .6 Provide metal brackets, frames, hangers, clamps, and related types of support structures where indicated or as required to support conduit and cable runs.
- .7 Ensure adequate support for raceways and cables dropped vertically to equipment where there is not wall support.

- .8 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .9 Do not use supports or equipment installed for other trades for conduit or cable support, except with permission of other trade and approval of Engineer.
- .10 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

1. GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data as required.

2. PRODUCTS

2.1 JUNCTION AND PULL BOXES

- .1 All junction and pull boxes to be of welded steel construction with screw-on flat covers for surface mounting.
- .2 For flush mounted pull and junction boxes, provide covers with 25 mm (minimum) trim flange all around.
- .3 For exterior work, provide steel or cast aluminum boxes of weather-resistant construction. Provide gasketed cover plates.

3. EXECUTION

3.1 JUNCTION, PULL BOXES, AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor.
- .3 Only main junction and pull boxes are indicated on drawings. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes or four 90° bends.

3.2 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Electrical General Requirements.

END OF SECTION

1. GENERAL

1.1 REFERENCES

- .1 CSA C22.1-15 Canadian Electrical Code, Part 1.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings as required.

2. PRODUCTS

2.1 DEVICE AND CONDUIT BOXES - GENERAL

- .1 Size boxes in accordance with CSA C22.1-15.
- .2 Use 4" square or larger outlet boxes as required for special devices.
- .3 Use ganged boxes where wiring devices are grouped.
- .4 Use combination boxes with barriers where outlets for more than one system are grouped.
- .5 Use utility boxes for interior exposed work.

2.2 DEVICE BOXES

- .1 Provide electro-galvanized steel single and multi-gang flush device boxes for flush installation.
- .2 Provide expansion and plaster rings to suit wall construction.

2.3 FITTINGS - GENERAL

- .1 Provide bushings and connectors with nylon insulated throats.
- .2 Provide knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 25 mm, and pull boxes for larger conduits.
- .4 Provide double locknuts and insulated bushings where rigid steel conduit terminates on sheet metal boxes.

3. EXECUTION

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam, or similar approved material to prevent entry of debris during construction. Remove paper upon completion of work.
- .3 For flush installations, mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated, and armoured cable connections. Reducing washers are not allowed.
- .5 Where conduit box trade size is 4" or greater in two or more dimensions, support box on two sides.
- .6 All conduits shall enter boxes from the bottom or side, in environments exposed to moisture.

END OF SECTION

1. GENERAL

1.1 LOCATION OF CONDUIT

- .1 Drawings do not indicate all conduit runs. Those indicated are in diagrammatic form only.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings as required.

2. PRODUCTS

2.1 APPROVED CONDUITS

- .1 Rigid galvanized steel threaded conduit.
- .2 Electrical metallic tubing (EMT).
- .3 Liquid-tight flexible steel conduit.

2.2 CONDUIT FASTENINGS

- .1 Use one-hole steel straps to secure surface conduits 50 mm and smaller. Use two-hole steel straps for conduits larger than 50 mm. Use anchors and supports suitable for the application.
- .2 Use beam clamps to secure conduits to exposed steel work.
- .3 Use channel type supports for two or more conduits. Space supports at 1.5 m (maximum) apart.
- .4 Use $\frac{3}{8}$ " mm diameter threaded rods to support suspended channels.
- .5 Wood anchors or supports are not permitted.

2.3 CONDUIT FITTINGS

- .1 Use only fittings which are approved for use with, and have the same coating as, the conduit to which they are fastened, and for the location in which they are installed.
- .2 Use factory manufactured elbows where 90° bends are required for 25 mm and larger conduits.

- .3 Use expansion joints for all connections from buildings to earth.

2.4 FISH CORD

- .1 Install polypropylene twine in all conduits designated as “empty”.

3. EXECUTION

3.1 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations, and cause minimum interference in spaces through which they pass.
- .2 Conceal all conduits except in mechanical and electrical service rooms, where conduit may be run exposed but must be installed to minimize exposure, and must be run perpendicular or parallel to building lines.
- .3 Use EMT conduit for fire alarm system, except where specified otherwise.
- .4 All EMT conduits which have a non-metallic adaptor in the run shall have a green insulated bond wire installed, to ensure grounding continuity.
- .5 Bend conduit cold. Replace conduit if kinked or flattened more than one-tenth of its original diameter.
- .6 Mechanically bend steel conduit over 19 mm diameter.
- .7 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .8 Install fish cord in empty conduits.
- .9 Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.
- .10 Dry conduits out before installing conductors.
- .11 Use rigid metal conduit where subject to mechanical injury.

3.2 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines, and in a neat workmanlike manner.
- .2 Run conduits in flanged portion of structural steel.

- .3 Group conduits wherever possible on suspended or surface channels.
- .4 Do not pass conduits through structural members, except as indicated.
- .5 Do not locate conduits less than 75 mm parallel to steam or hot water lines, with minimum of 25 mm at crossovers.

3.3 CONDUITS PENETRATING WALLS, CEILINGS, AND FLOORS

- .1 Install conduit seal when passing from warm to cold, or interior to exterior.
- .2 Provide fire seals all penetrations through fire walls.
- .3 Provide pull box or other approved conduit access to allow for installation of sealing compound.
- .4 Install sealing compound after conductors are installed.

3.4 CONDUITS PENETRATING ENCLOSURES

- .1 Conduit bushings with a ground lug must be installed on all conduits entering electrical enclosures.

3.5 FIRE ALARM SYSTEM CONDUITS

- .1 Install duct seal at conduit ends when connecting to smoke detectors and smoke alarms, in order to prevent migration of smoke through the conduit.

3.6 CONDUITS PENETRATING FIRE SEPARATIONS

- .1 Install fire rated conduit seal around all fire wall/compartments penetrations.

END OF SECTION

1. GENERAL

1.1 SUMMARY

- .1 This section covers fire alarm systems, including initiating devices, notification appliances, controls, and supervisory devices.
- .2 Work covered by the section includes the furnishing of labour, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.
- .3 Replace the existing fire alarm system with a new complete supervised addressable system including annunciator & control panel, fire detectors, pull stations, bell/strobes, conduit, wire, boxes, and etc.
- .4 The fire alarm system shall consist of all necessary hardware equipment and software programming to perform the following functions:
 - .1 Fire alarm and detection operations.
 - .2 Control and monitoring of smoke control equipment and other equipment as indicated in the drawings and specifications.

1.2 ACCEPTABLE MANUFACTURERS

- .1 Manufacturers: The equipment and services described in this specification are those supplied and supported by Simplex, and represent the base bid for the equipment.
 - .1 Subject to compliance with requirements, provide alternate products by one of the following:
 - .1 Edwards Systems Technology.
 - .2 Simplex.
 - .3 Notifier.
- .2 Being listed as an acceptable manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.
- .3 The manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained fire alarm technicians. The manufacturer and service organization shall have a minimum of 10 years experience in the fire protective signalling systems industry.

1.3 RELATED DOCUMENTS

- .1 Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 specification sections apply to this section.
- .2 The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply.
 - .1 Electrical General Requirements Section 26 05 00
 - .2 Wires and Cables, 0-1000 V Section 26 05 21
 - .3 Outlet Boxes, Conduit Boxes & Fittings Section 26 05 32
 - .4 Conduits, Conduit Fastenings & Conduit Fittings Section 26 05 34
- .3 The system and all associated operations shall be in accordance with the following:
 - .1 National Building Code, 2010.
 - .2 National Fire Code, 2010.
 - .3 NFPA 72, National Fire Alarm Code.
 - .4 CAN/ULC-S524-14, Standard for the Installation of Fire Alarm Systems.
 - .5 CAN/ULC-S536-13 Inspection and Testing of Fire Alarm System
 - .6 CAN/ULC-S537-13 Verification of Fire Alarm Systems
 - .7 CSA C22.1-12, Canadian Electrical Code, Part I.
 - .8 Local Jurisdictional Adopted Codes and Standards.

1.4 SYSTEM DESCRIPTION

- .1 General: Provide a complete, non-coded, single stage, addressable, microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings, and as specified herein.
- .2 Software: The fire alarm system shall allow for loading an editing instructions and operating sequences program as necessary. The system shall be capable of on-site programming to accommodate system expansion, and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory.
- .3 History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

-
- .4 Recording of Events: Record all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble), the device identification, date and time of the occurrence. The printout differentiates alarm signals from all other printer indications.
 - .5 Wiring/Signal Transmission:
 - .1 Transmission shall be addressable signal transmission, dedicated to fire alarm service only.
 - .2 System connections for initiating (signalling) circuits and notification appliance circuits shall be Class A.
 - .3 Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.
 - .6 Remote Access:
 - .1 FACP shall have the capability to provide remote access through a dial-up service modem using the public switched telephone system or a private switched telephone system.
 - .2 A personal computer or technician's laptop, configured with terminal emulation software shall have the ability to access the FACP for diagnostics, maintenance reporting, and information gathering.
 - .7 Required Functions: The following are required system functions and operating features:
 - .1 Priority of Signals: Alarm events have highest priority. Subsequent alarm events are queued in the order received, and do not affect existing alarm conditions. Supervisory and trouble events have second and third level priority respectively. Signals of a higher level of priority take precedence over signals of lower priority even though the lower priority condition occurred first. Annunciate all events regardless of priority or order received.
 - .2 Non-Interfering: The activation of an addressable device does not prevent the receipt of signals from subsequent activations.
 - .3 Transmission to Remote Central Station: Automatically route alarm, supervisory, and trouble signals to a remote central station service transmitter provided under another contract.

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- .4 Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP, indicating the location and type of device.
 - .5 General Alarm: A system general alarm shall include:
 - .1 Indication of alarm condition at the FACP.
 - .2 Identification of the device that is the source of the alarm at the FACP.
 - .3 Operation of audible and visible notification devices throughout the building until silenced at FACP.
 - .4 Shutting down supply and return fans serving zone where alarm is initiated.
 - .5 Notifying the local fire department.
 - .6 Restoring the condition shall cause the supervisory LED restore system to normal.
 - .7 Alarm Silencing: If the “Alarm Silence” button is pressed, all audible and visible alarm signals shall cease operation.
 - .8 System Reset
 - .1 The “System Reset” button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps (‘IN PROGRESS’, ‘RESET COMPLETED’) as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-alarmed the system. The display message shall indicate “ALARM PRESENT, SYSTEM RESET ABORTED”.
 - .2 Should an alarm condition continue, the system will remain in an alarmed state.
 - .9 Drill: A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.
 - .10 Walk Test: The system shall have the capacity of one (1) programmable pass code protected, one person testing group. The actuation of the “enable one person test” program at the control unit shall activate the “One Person Testing” mode of the system as follows:
 - .1 The community circuit connection shall be bypassed for the testing group.

- .2 Control relay functions associated to the testing group shall be bypassed.
- .3 The control unit shall indicate a trouble condition.
- .4 The alarm activation of any initiation device in the testing group shall cause the audible notification appliances to sound a code to identify the device.
- .5 The unit shall automatically reset itself after signalling is complete.
- .6 Any momentary opening of an initiating or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds, indicating the trouble condition.
- .8 Analog Smoke Sensors:
 - .1 Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
 - .2 Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.
 - .3 Programmable Sensitivity: Photoelectric smoke sensors shall have three sensitivity levels ranging from 2.5% to 3.7%, programmed and monitored from the FACP.
 - .4 Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a CRT display or printed for annual recording and logging of the calibration maintenance schedule.
 - .5 The FACP shall continuously perform an automatic self-test on each sensor, which will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF-TEST ABNORMAL" trouble condition.

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- .6 The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to indicate that a sensor requires cleaning. When a sensor's average value reaches a predetermined value, three progressive levels of reporting are provided. The first level shall indicate that a sensor is close to a trouble reporting condition, and will be indicated on the FACP as "ALMOST DIRTY". This condition provides a means to alert maintenance staff of a dirty sensor without creating a trouble in the system. If this indicator is ignored, a second level "DIRTY SENSOR" condition shall be indicated at the FACP, and subsequently a system trouble is reported to the Central Monitoring Station. The sensor base LED shall glow steady, giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. The "DIRTY SENSOR" trouble condition shall be indicated at the control unit.
- .9 Fire Suppression Monitoring
- .1 Water Flow: Activation of a water flow switch shall initiate general alarm operations.
- .2 Sprinkler Valve Tamper Switch: The activation of any valve tamper switch shall activate system supervisory operations.
- .3 WSO: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.
- .10 Audible/visible Alarm Notification: By horns and strobes in areas as indicated on drawings.
- .11 Power Requirements
- .1 The control unit shall receive 120 VAC power via a dedicated fused disconnect circuit.
- .2 The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of 24 hours, with 30 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
- .3 All circuits requiring system-operating power shall be 24 VDC, and shall be individually fused at the control unit.

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- .4 The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green “power on” LED shall be displayed continuously while incoming power is present.
 - .5 The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be indicated at the control unit.
 - .6 The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.
 - .7 Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.5 SUBMITTALS

- .1 General: Submit the following according to conditions of contract and as required.
 - .1 Product data sheets for system components, highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.
 - .2 Wiring diagrams from manufacturer.
 - .3 Shop drawings showing system details including location of FACP, all devices, and circuiting.
 - .4 System power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods, and under all voltage conditions per ULC and NFPA standards.
 - .5 System operation description including method of operation and supervision of each type of circuit, and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of SLC, NAC relay, sensor and auxiliary control circuits.
 - .6 Operating instructions for FACP.

- .7 Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.
- .8 Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
- .9 Record of field tests of system.
- .2 Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction (AHJ). Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the authority, make re-submissions if required to make clarifications or revisions to obtain approval.

1.6 QUALITY ASSURANCE

- .1 Installer Qualifications: A factory-authorized installer is to perform the work of this section.
- .2 Each and all items of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories Canada Inc. (ULC), and shall bear the "ULC" label.

1.7 EXTRA MATERIALS

- .1 General: Furnish extra materials, packaged with protective covering for storage, and identified with labels clearly describing contents as follows:
 - .1 Manual Pull Station Glass rods: Furnish quantity equal to 15% of the number of manual pull stations installed, minimum of 15 glass rods.
 - .2 Manual Pull Stations: Furnish quantity equal to 10% of the number of manual stations installed, minimum of two pull stations.
 - .3 Pluggable LED's for Remote Indicating Panels: Furnish quantity equal to 10% of the number of units installed but not less than one.
 - .4 Horn/Strobe Units: Furnish quantity equal to 10% of the number of units installed but not less than one.

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- .5 Smoke Sensors, Fire Detectors, and Flame Detectors: Furnish quantity equal to 10% of the number of units of each type installed but not less than one of each type.
 - .6 Sensor Bases: Furnish quantity equal to 2% of the number of units of each type installed but not less than one of each type.

2. PRODUCTS

2.1 FIRE ALARM CONTROL PANEL (FACP)

- .1 General: Comply with UL 864 “Control Units for Fire-Protective Signalling Systems”.
- .2 The following FACP hardware shall be provided:
 - .1 Power limited base panel with beige cabinet and door, 120 VAC input power.
 - .2 250 addressable point capacity (inputs or outputs).
 - .3 Maximum of 144 points of annunciation where one point of annunciation equals:
 - .1 One LED output or one switch input on a 24 Point I/O module.
 - .4 Four Class B or A (Style Y/Z) Notification Appliance Circuits (NAC; rated 2A @ 24VDC, resistive).
 - .5 Two-form “C” auxiliary output circuits (rated 2A @ 24VDC, resistive), operation is programmable for trouble, alarm, supervisory of other fire response function.
 - .6 Battery meter module provides ammeter and voltmeter for power supply monitoring.
 - .7 Dual municipal city circuit connection with disconnect switches for connection to either 24VDC remote station (reverse polarity) or local energy.
 - .8 The FACP shall support two RS-232-C ports.
 - .9 Supervised serial communication channel for control and monitoring of remotely located LCD annunciators and I/O panels.
 - .10 Point reporting DACT.

2.2 ARCTIC ALARM SYSTEM

- .1 Provide a new arctic alarm auto-dialler for fire department signaling, coordinate monitoring connection with arctic alarm ltd. Test and ensure that the system alarm, supervisory, and trouble signals are connected to FACP. Also, ensure two (2) phone lines for dact use; one dedicated; one line seize.
 - .1 Arctic Alarm sells auto dialer units c/w programming and ships to site and offers 6 hours of telephone help during the install.
 - .2 Contact Wes Hinchey at Arctic Alarm
 - .3 Supply and install for all necessary accessories, wiring, conduits and test after the installation.

2.3 ADDRESSABLE MANUAL PULL STATIONS

- .1 Description: Addressable single-action type, red LEXAN or metal, and finished in red with moulded, raised letter operating instructions of contrasting colour. Station will mechanically latch upon operation, and remain so until manual reset by opening with a key common with the control units.

2.4 SMOKE/HEAT SENSORS

- .1 General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems". Include the following features:
 - .1 Factory Nameplate: Serial number and type identification.
 - .2 Operating Voltage: 24 VDC, nominal.
 - .3 Self-Restoring: Sensors do not require resetting or readjustment after actuation to restore normal operation.
 - .4 Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Removal of the sensor head shall interrupt the supervisory circuit of the fire alarm detection loop, and cause a trouble signal at the control unit.
 - .5 Each sensor head shall contain an LED that will flash each time it is scanned by the control unit (once every 4 seconds). In alarm condition, the sensor head LED shall be on steady.

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- .6 Each sensor head shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
 - .7 The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
 - .8 Addressability: Sensors include a communication transmitter and receiver in the sensor head having a unique identification and capability for status reporting to the FACP.
 - .9 Each sensor shall be scanned by the control unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135°F and 15°F rate-of-rise for the heat sensor but shall indicate a "Wrong Device" trouble condition.
 - .2 Smoke sensors shall be of the photoelectric type. Where acceptable per manufacturer specifications, ionisation type sensors may be used.
 - .3 Duct smoke detectors shall be placed in both supply and return air ducts.
 - .4 Heat Sensor: Intelligent Heat Detector model includes the following features:
 - .1 Each sensor shall constantly run self-checks to provide important maintenance information. The results are automatically updated and permanently stored in the sensor's non-volatile memory.
 - .2 Each sensor shall be equipped with automatic device mapping which provides supervision of each device's installed location to prevent a detector from being reinstalled in a different location.
 - .3 In the case where the loop controller fails to communicate with the sensors on that circuit for more than 4 seconds, sensors shall switch to stand-alone operation. Each sensor continues to collect and analyze information and alarm if the ambient temperature increases above 135°F (57°C) rated "L" or above 200°F 90°C rated "H" or increases at a rate exceeding 135°F (8.3°C) per minute.
 - .4 Addressability: Sensors include a communication transmitter and receiver in the sensor head having a unique identification and capability for status reporting to the FACP.

- .5 Each sensor head shall be equipped with twin LEDs, a flashing green LED indicates normal system polling from the loop controller, a flashing red LED indicates the sensor is in alarm state, and both LEDs on steady indicates alarm state – stand-alone mode.

2.5 NON-ADDRESSABLE ALARM-NOTIFICATION APPLIANCES

- .1 Audible/Visible: Combination audible/visible (A/V) notification appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 85 dBA @ 24VDC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4” square electrical box, without the use of special adapters or trim rings. Appliances shall be wired with UTP conductors, having a minimum of three twists per foot. The appliance shall be capable of two-wire synchronization with one of the following options:
 - .1 Synchronized strobe with horn on steady.
 - .2 Synchronized strobe with temporal code pattern on horn.
 - .3 Synchronized strobe with march time cadence on horn.
 - .4 Synchronized strobe firing to NAC sync signal with horn silenced.

2.6 END-OF-LINE DEVICES

- .1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open, short, or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.7 ADDRESSABLE CIRCUIT INTERFACE MODULES

- .1 Addressable Circuit Interface Modules: Arrange to monitor one of more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of water flow, valve tamper, non-addressable devices, and for control of evacuation indicating appliances and AHU systems.
- .2 Addressable circuit interface modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signalling line or a separate two wire pair running from an appropriate power supply as required.

- .3 Type 3: Line powered monitor circuit interface module.
 - .1 This type of module is an individually addressable module that has both its power and its communications supplied by the two wire multiplexing signalling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module shall communicate status (normal, open circuit, short circuit, and current limited conditions) to the FACP.

2.8 EMERGENCY POWER SUPPLY

- .1 General: Components include battery and charger.
- .2 Battery: Sealed lead-acid type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 30 minutes.

3. EXECUTION

3.1 INSTALLATION, GENERAL

- .1 Install system components and all associated devices in accordance with applicable NFPA standards and manufacturer's recommendations.
- .2 Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm system. Examples of qualified personnel shall include but not be limited to the following:
 - .1 Factory trained and certified personnel.
 - .2 Certified fire alarm technician.
 - .3 Personnel licensed or certified by province or local authority.

3.2 EQUIPMENT INSTALLATION

- .1 Furnish and install a complete fire alarm system as described herein, and as shown on the plans. Include sufficient control unit(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.
- .2 Device Location Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

3.3 WIRING INSTALLATION

- .1 Existing fire alarm system conduit and wiring are to be re-used at existing device locations where applicable, otherwise provide new conduit and wiring. Provide new conduit and wiring for new devices.
- .2 System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the authority having jurisdiction (and shall be installed in accordance with the appropriate articles from the current approved edition of CSA C22.1-12, Canadian Electrical Code, Part I).
- .3 Contractor shall obtain from the fire alarm system manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the fire alarm system manufacturer.
- .4 Colour Coding: Colour code fire alarm conductors differently from the normal building power wiring. Use one colour code for alarm initiating device circuits wiring, and a different colour code for supervisory circuits. Colour code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.
- .5 Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other, in accordance with NFPA 72, with a minimum 1 hour rated cable assembly, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.
- .6 Wiring to Central Station Transmitter: 21 mm conduit between the FACP and the central station transmitter connection as indicated. Install number of conductors and electrical supervision for connecting wiring as required to suit central station monitoring function. Final connections to terminals in central station transmitter are made under another contract.

3.4 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services: Provide services of a factory authorized service representative to supervise the field assemble and connection of components, and the pre-testing, testing, and adjustment of the system.
- .2 Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include but shall not be limited to individuals with the following qualifications:

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- .1 Factory trained and certified.
 - .2 National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
 - .3 International Municipal Signal Association (IMSA) fire alarm certified.
 - .4 Certified by a province or local authority.
 - .5 Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
- .3 Pre-Testing: Determine, through pre-testing, the conformance of the system to the requirements of the drawings and specifications. Correct deficiencies observed in pre-testing. Replace malfunctioning or damaged item with new, and retest until satisfactory performance and conditions are achieved.
 - .4 Final Test Notice: Provide 10 day minimum notice in writing when the system is ready for final acceptance testing.
 - .5 Minimum System Tests: Test the system according to the procedures outline in ULC S536 and ULC S537.
 - .6 Retesting: Correct deficiencies indicated by tests, and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the specifications and complies with applicable standards.
 - .7 Horn test: Ensure that audibility testing is done as per NBC 2010. Also, ensure that the fire alarm verification report shall include audibility test in all rooms in the building and provide audibility levels for both ambient and fire alarm conditions.
 - .1 The minimum audibility level for the fire alarm system shall be 10 dBA above ambient conditions with a minimum of 65 dBA as per NBC, Article 3.2.4.19.
 - .8 Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.
 - .9 Final Test, Certificate of Completion, and Certificate of Occupancy:
 - .1 Test the system as required by the authority having jurisdiction in order to obtain a certificate of occupancy.

3.5 CLEANING AND ADJUSTING

- .1 Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

- .2 Occupancy Adjustments: When requested, within 1 year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.6 TRAINING

- .1 Provide the services of a factory authorized service representative to demonstrate the system, and train Owner's maintenance personnel as specified.

END OF SECTION