Fire Alarm System Upgrade
Phase II
Beaver Creek Minimum Institution

2000 Beaver Creek Drive, Gravenhurst, ON

PWGSC #R.080201.001

ISSUED FOR TENDER & PERMIT SPECIFICATIONS
January 19, 2018

Prepared For:
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Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this contract comprises of upgrade of the existing fire alarm systems in Beaver Creek Minimum Institution, located at 2000 Beaver Creek Drive, Gravenhurst, Ontario.

1.2 WORK BY OTHERS

.1 Co-operate with other Contractors in carrying out their respective Works and carry out instructions from Departmental Representative.

.2 Co-ordinate Work with that of other Contractors. If any part of Work under this Contract depends for its proper execution or result upon Work of another Contractor, report promptly to the Departmental Representative, in writing, any defects which may interfere with proper execution of Work.

1.3 WORK SEQUENCE

.1 Construct Work in stages to accommodate Owner's continued and intermittent use of premises during construction.

.2 Co-ordinate Progress Schedule and co-ordinate with Owner occupancy during construction.

.3 Required stages:

.1 Upgrade fire alarm systems in Minimum Institution one (1) building by one (1) building:

.1 Replace panel, upgrade fiber interface card, and install addressable signaling devices as required.

.2 Install fiber optic cable and connect it to the fire alarm network system.

.3 Program and verify the devices and system.

.2 Upgrade central control/monitoring panel in the duty post of principle entrance:

.1 Replace the existing annunciator panel with a new panel having control/display modules which can showing all fire zones, alarm/supervisory signal status (sprinkler flow switch, duct type smoke detectors, supervisory valves etc.) of systems in Minimum Institution.

.2 Program and verify the system.

.3 Connect fire alarm network system of the Minimum Institution to that of the Medium Institution in closed Class A loop.

.4 Upgrade Central Control/Monitoring panel in Main Communication Control Post at Gatehouse Building of Medium Institution:

.1 Add control/display modules to existing main panel which can showing all fire zones, alarm/supervisory signal status (sprinkler flow switch, duct type smoke detectors, supervisory valves etc.) of systems in Minimum Institution.

.2 Program and verify the system.

.5 Upgrade FireWorks which will monitor both institutions and replace workstations and printers:

.1 Upgrade FireWorks in Building BC12 (Activity Building) of Minimum Institution and relocate to BC43 (Works Building); replace workstation & printer.

.2 Upgrade FireWorks in Building FBD (Industries Building) of Medium Institution and relocate to instructor's office #D143; replace workstation & printer.

.3 Program and verify the system.

.4 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.

.5 Existing fire alarm system shall not be demolished until new fire alarm system has been verified, tested and signed off.

.1 Under no circumstance shall the building be unprotected by fire alarm/detection.

.6 Maintain fire access/control.

1.4 CONTRACTOR USE OF PREMISES

.1 Limit use of premises for Work, storage and access, to allow:

.1 Owner occupancy.

.2 Co-ordinate use of premises under direction of the Departmental Representative.

.3 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 Departmental Representative.

.6 At completion of operations condition of existing Work: equal to or better than that which existed before new Work started.

1.5 OWNER OCCUPANCY

Co-operate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Owner usage.

1.6 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:

.1 Contract drawings.
.2 Specifications.
.3 Addenda and amendments.
.4 Reviewed shop drawings.
.5 List of outstanding shop drawings.
.6 Change orders.
.7 Other modifications to Contract.
.8 Field test reports.
.9 Copy of approved Work Schedule.
.10 Health and Safety Plan and other safety related documents.
.11 Other documents as specified.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND FACILITIES

.1 Execute Work with least possible interference or disturbance to normal use of premises. Make arrangements with the Departmental Representative to facilitate Work as stated.

.2 Maintain existing services to building to provide personnel and vehicle access.

.3 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.

.4 Use only elevators existing in building for moving workers and material.

.1 Protect walls of passenger elevators, obtain approval of Departmental Representative prior to use.

.2 Accept liability for damage, safety of equipment and overloading of existing equipment.

1.3 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 Departmental Representative to facilitate execution of Work.

1.4 EXISTING SERVICES

.1 Notify, Departmental Representative of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of Work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on evenings or weekends.

.3 Provide for personnel, pedestrian and vehicular traffic.

1.5 SPECIAL REQUIREMENTS

.1 Coordinate construction schedule with departmental representative all work carried out in institutional facility to ensure minimal disturbance to facility during operational hours.

.2 Submit schedule providing weekly planned activities for construction. Revise schedule as construction progresses.

.3 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

1.6 BUILDING SMOKING ENVIRONMENT

.1 Smoking is permitted in designated areas only.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Submit to the Departmental Representative submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract time and no claim for extension by reason of such default will be allowed.

.2 Work affected by submittal shall not proceed until the 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.

.5 Review submittals prior to submission to the Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated 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 shall be considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from the requirements of contract documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are coordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative’s review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative’s review.

.10 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 the 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 coordinated, regardless of section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.3 Submit 1 electronic copy in Adobe Acrobat .pdf format of the following items requested in the specification sections or as requested by the Departmental Representative:

.1 Shop drawings of all products required within the project.

.2 Product data sheets or brochures where shop drawings will not be prepared due to standardized manufacture of product.

.1 If standardized product data sheets are being provided due to the standard nature or manufacture of a specific product, ensure that either information on other models or ratings not applicable to project is removed, or circle and/or highlight applicable model or rating information. If not all model or rating information is present on data sheet, supplement standard information to provide details applicable to project.

.3 Test reports.

.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.

.4 Certificates.

.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 and complete with project name.

.5 Manufacturer’s instructions.

.1 This may consist of pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.6 Manufacturer's Field Reports.

.1 This may include documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.7 Operation and Maintenance Data.

.8 Programming, settings, and annotation for any electronic or digital control devices.

.4 For the Adobe Acrobat .pdf electronic document, group all related documents into one consistent and logically arranged .pdf document, with the detailed title page indicating which specification sections or item the document covers. Indicate equipment tag names on shop drawing submissions.

.5 Allow six (6) business days for Departmental Representative review of each submission.

.6 Adjustments made on shop drawings by Departmental Representative are not intended to change contract price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.7 Make changes in shop drawings as Departmental Representative may require, consistent with contract documents. When resubmitting, notify Departmental Representative in writing of any revisions other than those requested.

.8 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.

.9 Submissions shall include:

.1 Date and revision dates.

.2 Project title and number.

.3 Specification section number.

.4 Name and address of:

.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

.5 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with contract documents.

.6 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.

.10 After Departmental Representative’s review, distribute copies.

.11 If upon review by Departmental Representative, 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.

.12 The review of shop drawings by the Departmental Representative is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and contract documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.3 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit WSIB status and any other specification required documentation.

.2 Submit transcription of insurance immediately after award of Contract.

Part 2 Products

2.1 Not Used.

Part 3 Execution

3.1 Not Used.

END OF SECTION

Part 1 General

1.1 PURPOSE

.1 To ensure that both the construction project and the institutional operations may proceed without undue disruption or hindrance and that the security of the Institution is maintained at all times.

1.2 DEFINITIONS

.1 "Contraband" means:

.1 An intoxicant, including alcoholic beverages, drugs and narcotics.

.2 Tobacco or associated tobacco products.

.3 An igniting device, lighter or matches.

.4 A weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization.

.5 An explosive or a bomb or a component thereof.

.6 Currency over any applicable prescribed limit, $50.00 when possessed by an inmate without prior authorization.

.7 Any item not described in paragraphs 1.2.1.1 to 1.2.1.6 that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.

.2 "Unauthorized Smoking and related Items" means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing tobacco, cigarette making machines, matches and lighters.

.3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.

.4 "CSC" means Correctional Service Canada.

.5 "Director" means Director, Warden or Superintendent of the Institution as applicable.

.6 ."Construction Employees" means persons working for the General Contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.

.7 "Departmental Representative" means the project manager from Public Works and Government Services Canada.

.8 "Perimeter" means the fenced or walled area of the Institution that restrains the movement of the inmates.

.9 "Construction Limits" means the area as shown on the contract drawings that the Contractor will be allowed to work. This area may or may not be isolated from the security area of the Institution.

1.3 PRELIMINARY PROCEEDINGS

.1 Prior to the commencement of work, the Contractor shall meet with the Director or his/her representative to:

.1 Discuss the nature and extent of all activities involved in the Project.

.2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.

.2 Contractor shall:

.1 Ensure that all Construction Employees are aware of the security requirements.

.2 Ensure that a copy of the security requirements is always prominently on display at the job site.

.3 Co-operate with institutional personnel in ensuring that security requirements are observed by all Construction Employees.

1.4 CONSTRUCTION EMPLOYEES

.1 Submit to the Site Authority, a list of the names with date of birth of all Construction Employees to be employed on the construction site and a security clearance form for each employee.

.2 Employees must bring current photo identification for entry into the institution.

.3 The contractor may be required to provide a police check for all of its employees.

.4 An employee will be refused entry into the institution if they are deemed to be a risk to security.

.5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:

.1 Appear to be under the influence of alcohol, drugs or narcotics.

.2 Behave in an unusual or disorderly manner.

.3 Are in possession of contraband.

.6 Smoking is in designated areas only.

1.5 VEHICLES

.1 All unattended vehicles on CSC property shall have windows closed; doors and trunks shall be locked and keys removed. The keys shall be securely in the possession of the owner or an employee of the company that owns the vehicle.

.2 The Director may limit at any time the number and type of vehicles allowed within the Institution.

.3 Drivers of delivery vehicles for material required by the project will not require security clearances but must remain with their vehicle the entire time that the vehicle is in the Institution. The Director may require that these vehicles be escorted by Institutional Staff or Commissionaires while in the Institution.

.4 If the Director permits trailers to be left inside the secure perimeter of the Institution, these trailer doors will be locked at all times. All windows will be securely locked when left unoccupied. All trailer windows shall be covered with expanded metal mesh. All storage trailers inside and outside the perimeter shall be locked when not in use.

1.6 PARKING

.1 Parking area(s) to be used by Construction Employees will be designated by the Director. Parking in other locations will be prohibited and vehicles may be subject to removal.

1.7 SHIPMENTS

.1 All shipments of project material, equipment and tools shall be addressed in the Contractor's name to avoid confusion with the Institution's own shipments. The Contractor must have his/her own employees on site to receive any deliveries or shipments. CSC staff will NOT accept receipt of deliveries or shipments of any material, equipment or tools.

1.8 TELEPHONES

.1 There will be no installation of telephones, Facsimile machines and computers with Internet connections permitted within the perimeter of the Institution unless prior approval of the Director is received.

.2 The Director will ensure that approved telephones, facsimile machine and computers with internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an internet connection to unauthorized personnel.

.3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, BlackBerries, telephone used as 2-way radios, are not permitted within the Institution unless approved by the Director. If wireless cellular

telephones are permitted, the user will not permit their use by any inmate.

.4 The Director may approve but limit the use of two way radios.

1.9 WORK HOURS

.1 Work hours within the Institution are: Monday to Friday 07:30 a.m. to 4:00 p.m.

.2 Work will not be permitted during weekends and statutory holidays without the permission of the Director. A minimum of seven days advance notice will be required to obtain the required permission. In case of emergencies or other special circumstances, this advance notice may be waived by the Director.

1.10 OVERTIME WORK

.1 No overtime work will be allowed without permission of the Director. Give a minimum forty-eight (48) hours advance notice when overtime work on the construction project is necessary and approved. If overtime work is required because of an emergency such as the completion of a concrete pour or work to make the construction safe and secure, the Contractor shall advise the Director as soon as this condition is known and follow the directions given by the Director. Costs to the Crown for such events may be attributed to the Contractor.

.2 When overtime work, weekend, or statutory holiday work is required and approved by the Director, extra staff members may be posted by the Director or his/her designate, to maintain the security surveillance. The Departmental Representative may post extra staff for inspection of construction activities. The actual cost of this extra staff may be subject to reclamation by the Crown.

1.11 TOOLS AND EQUIPMENT

.1 Maintain a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required.

.2 Throughout the construction project maintain up-to-date the list of tools and equipment specified above.

.3 Keep all tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.

.4 Store all tools and equipment in approved secure locations.

.5 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the Contractor. Scaffolding shall be secured and locked when not erected and when erected, will be secured in a manner agreed upon with the Institutional designate.

.6 All missing or lost tools or equipment shall be reported immediately to the Director.

.7 The Director will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:

.1 At the beginning and conclusion of every construction project.

.2 Weekly, when the construction project extends longer than a one week period.

.3 The Contractor may be subject to random checks by security staff to ensure proper storage and security of tools throughout the project.

.8 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The Contractor will be given at the beginning of the day, a quantity that will permit one day's work. Used blades/cartridges will be returned to the Director's representative at the end of each day.

.9 If propane or natural gas is used for heating the construction, the Institution will require that an employee of the Contractor supervise the construction site during non-working hours.

.10 If torches or grinders are required tools to perform Work, Contractor must complete a Hot Work Permit as supplied by CSC. Completed original form(s) are copied and posted on the work site in a conspicuous location. Original documents are to remain with the Institutional Fire Chief.

1.12 KEYS

.1 Security Hardware Keys:

.1 The Contractor shall arrange with the security hardware supplier/installer to have the keys for the security hardware to be delivered directly to Institution, specifically the Security Maintenance Officer (SMO).

.2 The Security Maintenance Officer (SMO) will provide a receipt to the Contractor for security hardware keys.

.3 The Contractor will provide a copy of the above-mentioned receipt to the Departmental Representative.

.2 Other Keys:

.1 The Contractor will use standard construction cylinders for locks for his/her use during the construction period.

.2 The Contractor will issue instructions to his/her employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.

.3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:

.1 Prepare an operational keying schedule.

.2 Accept the operational keys and cylinders directly from the lock manufacturer

.3 Arrange for removal and return of the construction cores and install the operational core in all locks.

.3 Upon putting operational security keys into use, the CSC construction escort shall obtain these keys as they are required from the Security Maintenance Officer (SMO) and open doors as required by the Contractor. The Contractor shall issue instructions to his/her employees advising them that all security keys shall always remain with the CSC construction escort.

1.13 SECURITY HARDWARE

.1 Turn over all removed security hardware to the Director of the Institution for disposal or for safekeeping until required for re-installation.

1.14 PRESCRIPTION DRUGS

.1 Employees of the Contractor who are required to take prescription drugs during the workday shall obtain approval of the Director to bring a one day supply only into the Institution.

1.15 SMOKING RESTRICTIONS

.1 Contractors and construction employees are not permitted to smoke inside correctional facilities or outdoors within the perimeter of a correctional facility and must not possess unauthorized smoking items within the perimeter of a correctional facility.

.2 Contractors and construction employees who are in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist, will be directed to leave the institution.

.3 Smoking is only permitted outside the perimeter of a correctional facility in an area to be designated by the Director.

1.16 CONTRABAND

.1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on Institutional Property.

.2 Discovery of Contraband on the construction site and the identification of the person(s) responsible for the Contraband shall be reported immediately to the Director.

.3 Contractors shall be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of Contraband may result in cancellation of the security clearance of

the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.

.4 Presence of arms and ammunition in vehicles of Contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

1.17 SEARCHES

.1 All vehicles and persons entering Institutional property may be subject to search.

.2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of Contraband or unauthorized items, he/she may order that person to be searched.

.3 All employees entering the Institution may be subject to screening of personal effects for traces of Contraband drug residue.

1.18 ACCESS TO AND REMOVAL FROM INSTITUTION PROPERTY

.1 Construction personnel and commercial vehicles will not be admitted to the Institution after normal working hours, unless approved by the Director.

1.19 MOVEMENT OF VEHICLES

.1 Vehicles shall be refused access to Institutional Property if, in the opinion of the Director, they contain any article which may jeopardize the security of the Institution.

.2 Private vehicles of Construction Employees will not be allowed within the security wall or fence of medium or maximum security Institutions without the permission of the Director.

.3 With the approval of the Director, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another solid object.

1.20 MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY

.1 Subject to the requirements of good security, the Director will permit the Contractor and his/her employees as much freedom of action and movement as is possible.

.2 However, notwithstanding paragraph above, the Director may:

.1 Prohibit or restrict access to any part of the Institution.

.2 Require that in certain areas of the Institution, either during the entire construction project or at certain intervals, Construction Employees only be allowed access when accompanied by a member of the CSC security staff.

.3 During the lunch and coffee/health breaks, all employees will remain within the construction site. Employees are not permitted to eat in the officer's lounge and dining room.

1.21 SURVEILLANCE AND INSPECTION

.1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.

.2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among Construction Employees and maintained throughout the construction project.

1.22 STOPPAGE OF WORK

.1 The Director may request at any time that the Contractor, his/her employees, sub-contractors and their employees not enter or leave the work site immediately due to a security situation occurring within the Institution. The Contractor's site supervisor shall note the name of the staff member making the request and the time of the request and obey the order as quickly as possible.

.2 The Contractor shall advise the Departmental Representative within 24 hours of this delay to the progress of the work.

1.23 CONTACT WITH INMATES

.1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any employee doing any of the above will be removed from the site and his/her security clearance revoked.

.2 It is forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this Contract.

1.24 COMPLETION OF CONSTRUCTION PROJECT

.1 Upon completion of the construction project or, when applicable, the takeover of a facility, the Contractor shall remove all remaining construction material, tools and equipment that are not specified to remain in the Institution as part of the construction contract.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Province of Ontario

.1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990 as amended 213/91

1.2 GENERAL

.1 The Contractor shall register the project, as required by OHSA and regulations, with the Ministry of Labour before commencing any Work on site. A copy of the registration must be provided to the Departmental Representative before starting Work on the site and a copy must be posted in a visible location on the work site at all times.

.2 The Contractor shall appoint a competent person, as defined by the OHSA, as the project Supervisor.

.3 The Supervisor shall supervise the Work at all times either personally or by having an identified assistant do so personally.

.4 The Supervisor shall inspect the work site and equipment associated with the project at least once a week. A copy of the inspection report must be provided to the Departmental Representative.

.5 The Contractor, in consultation with the Departmental Representative, shall provide a health and safety management plan which as a minimum will include:

.1 A Site Management Plan, which includes a general overview of the project and roles and responsibilities for:

.1 Site workers.

.2 Site safety coordinator.

.3 Project environmental health and safety coordinator.

.4 Task managers.

.2 A Hazard Identification Plan, which includes primary environmental hazards, personal conduct and hygiene, potential site hazards, and others such as:

.1 Survey work in traffic.

.2 Physical.

.3 Fire and explosion.

.4 Confined space entry.

.5 Cranes, hoists, and rigging.

.6 Crane suspended personnel platforms.

.7 Biological.

.8 Stress and fatigue.

.9 Noise.

.10 Personal security.

.11 Adverse weather conditions.

.12 Other site activities.

.3 A Personal Protective Equipment Inventory, which includes:

.1 Requirements for all site personnel

.2 Selection, maintenance and continual assessment

.3 An Emergency Preparedness and Response Plan, which addresses

.4 First aid

.5 Fire Protection

.6 Critical Injury

.7 Accident or Incident

.4 The plan shall be posted in a visible location on the work site prior to the commencement of any Work.

.5 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to the Contractor within 10 business days after receipt of plan. Revise the plan as appropriate and resubmit plan to the Departmental Representative within 10 business days after receipt of comments from the Departmental Representative.

.6 Departmental Representative's review of Contractor's final Health and Safety Plan should not be construed as approval and does not reduce the Contractor's

overall responsibility for construction Health and Safety.

.6 The Contractor shall post signage in prominent locations identifying the required protective clothing or devices required to be worn on the work site and the contractor shall ensure compliance with these requirements.

.7 The Contractor shall remove waste material and debris from the work site(s) to a disposal area at least once a day or more frequently if necessary to prevent the creation of a hazardous condition.

.8 The Contractor shall ensure that fire extinguishing equipment is provided to ensure compliance with Section 52 to 58, O. Reg. 213.

.9 The Contractor shall ensure all vehicles, machinery, tools and equipment used on the work site are operated and maintained in accordance with Section 93 to 116, O. Reg. 213.

.10 The Contractor shall ensure no worker other than an electrician or apprentice certified under the Trades Qualifications and Apprenticeship Act to do electrical work on the work site.

.11 File Notice of Project with provincial authorities prior to commencement of Work.

1.3 CHEMICALS

.1 The Contractor must ensure each chemical container brought on site is clearly labelled with the identity of the chemical, information for the safe handling of the chemical and the location of the MSDS.

.2 The Contractor must ensure adequate measures are taken to control the distribution, within the application area or throughout the building, of fumes/vapours before applying flammable, noxious or volatile materials.

.3 The Contractor may be required to schedule the application of hazardous materials which might affect the well-being of any workers or disrupt work of other contractors and cannot be adequately controlled to prevent such occurrences to evening or weekend periods.

.4 The Contractor must ensure workers wear the required personal protective equipment (respiratory protection,

protective clothing, hand protection, eye/face protection, etc.) when working with chemicals.

.5 The Contractor must ensure the safe use and disposal of all chemicals that they are using. No chemicals and/or chemical waste product shall be disposed of on site without prior approval of the Departmental Representative.

.6 The Contractor may not store chemicals and compressed gas cylinders on site without approval of the Departmental Representative. If approved, the contractor must ensure incompatible chemicals are stored separately.

1.4 DESIGNATED SUBSTANCES / HAZARDOUS WASTE

.1 The Contractor shall provide evidence of competency with regards to the Environmental Protection Act and its regulations, a copy of safe handling work plan prior to commencing with Work in the area.

.2 The Contractor shall register the project as a waste generator site, if not already registered, for the waste that will be generated as a result of the work activities related to the project.

.3 The Contractor shall ensure and provide evidence that all hazardous wastes removed from the sites sent to a licensed waste disposal site by a licensed carrier and advise the responsible individual when necessary testing is to be carried out.

.4 The Contractor shall retain copies of all hazardous waste manifests on file.

.5 The Contractor shall inspect the project daily to monitor compliance with designated substances and hazardous waste regulations.

.6 The Contractor shall provide access to the responsible individual for review of all inspection reports.

1.5 FALL PROTECTION

.1 The Contractor shall comply with the requirements of Section 26, O. Reg. 213 and Sections 85 and 86, O. Reg. 851.

.2 The Contractor shall provide, upon request, proof of worker training in the use of their fall protection systems.

.3 The contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.6 CONFINED SPACE ENTRY

.1 Access confined spaces only after receipt of written permission from the Departmental Representative.

.2 The Contractor shall comply with the requirements of Section 60 to 63, O. Reg. 213 as amended by O. Reg. 628 and Sections 67 to 71, O. Reg. 851 as amended by O. Reg. 629.

.3 The Contractor shall provide, upon request, a copy of their Confined Space Entry Procedure and proof of worker training in confined space entry.

.4 The Contractor shall inform the Departmental Representative prior to entering a confined space to ensure all the isolation of all potential hazards.

.5 The Contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.7 LADDERS

.1 The Contractor shall comply with the requirements of Section 78 to 84, O. Reg. 213 and Sections 73, O. Reg. 851.

.2 The Contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.8 WELDING/CUTTING

.1 Must obtain a “Hot Work Permit” from the institutional Fire Chief.

.2 The Contractor shall comply with the requirements of Section 122 to 124, O. Reg. 213.

.3 The Contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.9 EXPLOSIVE ACTUATED FASTENING TOOL

.1 Powder actuated devices are not permitted.

1.10 EXCAVATING AND TRENCHING

.1 The Contractor shall ensure no person enters an excavation

unless another worker is working above ground close to the excavation or to the means of access to it.

.2 The Contractor shall arrange the locating and marking of gas, electrical and other services prior to commencing an excavation.

.3 The Contractor shall obtain approval from the Departmental Representative before arranging the shut off and disconnection of a service that may pose a hazard.

.4 The Contractor shall comply with the requirements of Section 230 to 242, O. Reg. 213.

.5 The Contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.11 PUBLIC WAY PROTECTION

.1 The Contractor shall comply with the requirements of Section 64 to 66, O. Reg. 213.

1.12 TRAFFIC CONTROL

.1 The Contractor shall not block or restrict traffic flow on driveways, laneways or emergency vehicle routes without approval of the Departmental Representative. The Contractor must ensure work areas are clear identified with traffic control devices necessary to provide vehicular traffic with sufficient warning of the Work being performed and to protect the workers performing the work.

.2 The Contractor shall not block or restrict pedestrian access to walkways without approval of Departmental Representative. The Contractor must provide a safe and clearly identified route for pedestrians in these circumstances

1.13 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by the Departmental Representative.

.2 Provide the Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance

of health and safety regulations is not corrected.

Part 2 Products

2.1 Not Used.

Part 3 Execution

3.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSPECTION

.1 Allow Departmental Representative 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 the Departmental Representative 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 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with the contract documents. If, upon examination such Work is found not in accordance with the contract documents, correct such Work and pay cost of examination and correction.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent inspection/testing agencies will be engaged by the Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the Departmental Representative.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with contract documents.

.4 If defects are revealed during inspection and/or testing, an appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by the Departmental Representative at no cost to the Departmental Representative. Pay costs for re-testing and re-inspection.

1.3 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

.1 Notify appropriate agency and the Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 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 Departmental Representative as failing to conform to the contract documents. Replace or re-execute in accordance with the contract documents.

.2 Make good other Contractor's Work damaged by such removals or replacements promptly.

.3 If in opinion of the Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with contract documents, Departmental Representative will deduct from the contract amount the difference in value between Work performed and that called for by the contract documents, the amount of which will be determined by the Departmental Representative.

1.6 REPORTS

.1 Submit copy of inspection and test reports to the Departmental Representative.

.2 Provide copies to subcontractor/manufacturer of Work being inspected or tested.

1.7 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of sections required to provide mock-ups.

.2 Construct in locations acceptable to the Departmental Representative as specified on site.

.3 Prepare mock-ups for the Departmental Representative and Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups 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.

.5 Mock-ups may remain as part of Work if deemed acceptable by the Departmental Representative.

Part 2 Products

2.1 Not Used.

Part 3 Execution

3.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards. List of standards reference writing organizations is contained in Section 28 31 00.01.

.2 Conform to these reference standards, in whole or in part as specifically requested in the specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, the Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be borne by the Departmental Representative in event of conformance with the contract documents or by Contractor in event of non-conformance.

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 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of Work.

.3 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.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.6 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 Departmental Representative 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 Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in contract amount or contract time.

1.4 STORAGE, HANDLING AND PROTECTION

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

.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 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.

.5 Remove and replace damaged products at own expense and to satisfaction of the Departmental Representative.

.6 Touch-up damaged factory finished surfaces to the Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

1.6 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 the Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that the Departmental Representative will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Departmental Representative to require removal and re-installation at no increase in contract price or contract time.

1.7 QUALITY OF WORK

.1 Ensure quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify the Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. The Departmental Representative and Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of quality of Work in cases of dispute rest solely with the Departmental Representative whose decision is final.

1.8 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.

1.9 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation inform the Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.10 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.

1.11 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform the Departmental Representative of conflicting installation. Install as directed.

1.12 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 Keep exposed fastenings to a minimum, space evenly and install neatly.

.4 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 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.

.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.

1.14 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 the Departmental Representative.

1.15 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved

by authority having jurisdiction. Stake and record location of capped service.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by the Owner or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by the Departmental Representative. Do not burn waste materials on site, unless approved by the Departmental Representative.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Dispose of waste materials and debris at designated dumping areas on Crown property off site.

.5 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

.6 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.7 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.8 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.9 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

.1 When Work is substantially performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris other than that caused by Owner or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by the Departmental Representative. Do not burn waste materials on site, unless approved by the Departmental Representative.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.

.9 Clean lighting reflectors, lenses, and other lighting surfaces.

.10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.12 Sweep and wash clean paved areas.

.13 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

.14 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 20.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT GOALS

.1 Prior to start of Work conduct meeting with the Departmental Representative to review and discuss waste management goal and Contractor's proposed Waste Reduction Workplan for Construction, Renovation and/or Demolition (CRD) waste to be project generated.

.2 Waste management goal: to divert a minimum 75 percent of total Project Waste from landfill sites. Prior to project completion provide the Departmental Representative with documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.

.3 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.

.4 Protect environment and prevent environmental pollution damage.

1.2 REFERENCE STANDARDS

.1 Ontario Ministry of Environment

- .1 Ontario Environmental Protection Act (EPA)
  - .1 Regulation 102/94, Waste Audits and Waste Reduction Workplans
  - .2 Regulation 103/94, Source Separation Programs
- .2 Canadian Construction Association (CCA)
  - .1 CCA 81-2001: A Best Practices Guide to Solid Waste Reduction
- .3 Public Works and Government Services Canada (PWGSC)
  - .1 2002 National Construction, Renovation and Demolition Non-Hazardous Solid Waste Management Protocol
  - .2 CRD Waste Management Market Research Report (available from PWGSC's Environmental Services)

1.3 DEFINITIONS

.1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental Representative.

.2 Class III: non-hazardous waste – construction renovation and demolition waste.

.3 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities

.4 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.

.5 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.6 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.7 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.

.8 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.

.9 Salvage: removal of structural and non-structural materials from deconstruction/ disassembly projects for purpose of reuse or recycling.

.10 Separate Condition: refers to waste sorted into individual types.

.11 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.

.12 Waste Diversion Report: detailed report of final results, quantifying cumulative weights and percentages of waste materials reused, recycled and landfilled over course of project. Measures success against Waste Reduction Workplan (WRW) goals and identifies lessons learned.

.13 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating required submittal and reporting requirements.

1.4 DOCUMENTS

.1 Post and maintain in visible and accessible area at job site, one copy of following documents:

.1 Waste Source Separation Program.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Prepare and submit following prior to project start-up:

.1 Electronic copy of Waste Source Separation Program (WSSP).

.3 Prepare and submit on monthly basis, throughout project or at intervals agreed to by Departmental Representative the following:

.1 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.

.4 Submit prior to final payment the following:

.1 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

1.6 WASTE SOURCE SEPARATION PROGRAM (WSSP)

.1 As part of WRW, prepare WSSP prior to project start-up.

.2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill.

.3 Provide list and drawings of locations that will be made available for sorting, collection, handling and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.5 Locate containers to facilitate deposit of materials without hindering daily operations.

.6 Provide training for workers, contractor, sub-contractors in handling and separation of materials for reuse and/or recycling.

.7 Locate separated materials in areas which minimizes material damage.

.8 Clearly and securely label containers to identify types/conditions of materials accepted and assist sub-contractors, contractor, workers in separating materials accordingly.

.9 Monitor on-site waste management activities by conducting periodic site inspections to verify: state of signage, contamination levels, bin locations and condition, personnel participation, use of waste tracking forms and collection of waybills, receipts and invoices.

.10 On-site sale of salvaged materials is not permitted unless authorized in writing by Departmental Representative and provided that site safety regulations and security requirements are adhered to.

1.7 USE OF SITE AND FACILITIES

.1 Execute Work with minimal interference and disturbance to normal use of premises.

.2 Maintain security measures established by facility provide temporary security measures approved by the Departmental Representative.

1.8 WASTE PROCESSING SITES

.1 Contractor is responsible to research and locate waste diversion resources and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling.

1.9 QUALITY ASSURANCE

.1 After award of Contract, a mandatory site examination will be held for this Project for Contractor and/or sub-contractors responsible for construction, renovation demolition/deconstruction waste management.

.1 Date, time and location will be arranged by the Departmental Representative.

1.10 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by the Departmental Representative.

.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 licensed disposal facility.

.5 Protect structural components not removed and salvaged materials from movement or damage.

.6 Support affected structures. If safety of building is endangered, cease operations and immediately notify the Departmental Representative.

.7 Protect surface drainage, mechanical and electrical from damage and blockage.

.8 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.

.9 Separate and store materials produced during project in designated areas.

.10 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off site processing facility for separation.

.3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.

.4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

1.11 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of paint thinner, waste, volatile materials into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials on-site as Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.

1.12 SCHEDULING

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 APPLICATION

.1 Do Work in compliance with WRW and WSSP.

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

3.2 CLEANING

.1 Progress Cleaning: leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management: separate waste materials for reuse and recycling

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.2 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

.1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by the Departmental Representative, and consistent with applicable fire regulations.

.1 Mark containers or stockpile areas.

.2 Provide instruction on disposal practices.

.2 On-site sale of reusable, salvaged, recyclable, recovered material is not permitted.

3.4 WASTE DIVERSION REPORT

.1 At completion of Project, prepare written Waste Diversion Report indicating quantities of materials reused, recycled or disposed of as well as the following:

.1 Identify final diversion results and measure success against goals from WRW.

.2 Compare final quantities/percentages diverted with initial projections in Waste Audit and WRW and explain variances.

.1 Supporting documentation.

.2 Waybills and tracking forms.

.3 Description of issues, resolutions and lessons learned.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Contractor's Inspection: Contractor – conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to contract documents.

.1 Notify the Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.

.2 Request the Departmental Representative's inspection.

.2 Departmental Representative' Inspection:

.1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with the contract documents.

.2 Defects: corrected and deficiencies completed.

.3 Equipment and systems: tested, adjusted, balanced and fully operational.

.4 Operation of systems: demonstrated to the Owner's personnel.

.5 Work: complete and ready for final inspection.

.4 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by the Departmental Representative, and Contractor.

.2 When Work incomplete according to the Departmental Representative, complete outstanding items and request re-inspection.

.5 Declaration of Substantial Performance: when the Departmental Representative considers deficiencies and defects corrected and requirements of the Contract have been substantially performed, make application for Certificate of Substantial Performance.

1.2 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 20.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMISSION

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Copy will be returned with Departmental Representative's comments.

.3 Revise content of documents as required prior to final submittal.

.4 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative four (4) final copies of operating and maintenance manuals in English in accordance with Specification Section 01 33 00.

.5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in work.

.6 If requested, furnish evidence as to the type, source and quality of products provided.

.7 Defective products will be rejected, regardless of previous inspections. Replace products at Contractor's expense.

.8 Pay costs of transportation of submissions documentation.

1.2 FORMAT

.1 Organize data in the form of an instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 Provide binders labeled on the front cover and on the binder edge with the following information: building name and address, project name, project number, completed date (e.g., January 2010).

.1 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Text: manufacturer's printed data, or typewritten data.

.5 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.6 Provide any electronic or digital programming, settings, control, or annotation in both readable paper form in the binder and as original software files on the CD in the required and compatible file format necessary for working with the devices.

.7 Provide one scaled CAD files in dwg format on CD.

.8 Provide one complete Adobe Acrobat .pdf format file of the complete Operations and Maintenance Manual on CD.

1.3 CONTENTS – EACH VOLUME

.1 Table of Contents, provide:

.1 Title of project.

.2 Date of submission, names.

.3 Addresses, and telephone numbers of Departmental Representative and Contractor with name of responsible parties.

.4 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including the local source of supplies and replacement parts.

.3 Product data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

.6 Arrange content by systems under section numbers and sequence of the specification’s Table of Contents.

.1 Provide tabbed fly leaf for each separate product and system, with typed description of the product and major component parts of equipment.

1.4 AS-BUILTS AND SAMPLES

.1 In addition to requirements in General Conditions, maintain at the site for the Departmental Representative, one record copy of:

.1 Contract drawings.

.2 Specifications.

.3 Addenda and amendments.

.4 Change orders and other modifications to the contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with section number listings in Table of Contents of this project manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by the Departmental Representative.

1.5 RECORDING SITE CONDITIONS VARIATIONS

.1 Record information on set of black line opaque drawings provided by the Departmental Representative.

.2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress. Do not conceal work until required information is recorded.

.4 Contract drawings and shop drawings: legibly mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original contract drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: legibly mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by addenda and change orders.

.6 Other documents: maintain manufacturer's certifications, inspection certifications, and field test records, required by individual specifications sections.

1.6 FINAL SURVEY

.1 Submit final site survey certificate.

1.7 EQUIPMENT AND SYSTEMS

.1 Each item of equipment and each system: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

.5 Maintenance requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and a list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer/Contractor.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and reports as specified in these specifications.

.15 Additional requirements: as specified in individual specification sections.

1.8 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual specifications sections.

1.9 SPARE PARTS

.1 Provide spare parts, in quantities as specified in individual technical specification sections.

.2 Provide items of same manufacture and quality as items in work.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to the Departmental Representative. Include approved listings in the Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.10 MAINTENANCE MATERIALS

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in work.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to the Departmental Representative. Include approved listings in the Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.11 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual technical specification sections.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to the Departmental Representative. Include approved listings in the Maintenance Manual.

1.12 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of the Departmental Representative.

1.13 WARRANTIES AND BONDS

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

.4 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Co-execute submittals when required.

.7 Retain warranties and bonds until time specified for submittal.

Part 2 Products

2.1 Not Used.

Part 3 Execution

3.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 28 31 00.01 – Multiplex Fire Alarm System

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection.

.2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.

.3 Preparation:

.1 Verify conditions for demonstration and instructions comply with requirements.

.2 Verify designated personnel are present.

.3 Ensure equipment has been inspected and put into operation.

.4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 and equipment and systems are fully operational.

.4 Demonstration and Instructions:

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

.5 Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment or system as follows:

.1 Section 28 31 00.01: 2 hours of instruction.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to

designated dates, for Departmental Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

.5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.4 QUALITY ASSURANCE

.1 When specified in individual sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:

.1 Instruct Owner's personnel.

.2 Provide written report that demonstration and instructions have been completed.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.

.2 Acronyms:

.1 Cx – Commissioning.

.2 EMCS – Energy Monitoring and Control Systems.

.3 O M – Operation and Maintenance.

.4 PI – Product Information.

.5 PV – Performance Verification.

.6 TAB – Testing, Adjusting and Balancing.

1.2 GENERAL

.1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:

.1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.

.2 Effectively train O M staff.

.2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.

.1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactive with each other as intended in accordance with Contract Documents and design criteria.

.2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

.3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.3 COMMISSIONING OVERVIEW

.1 Cx to be a line item of Contractor's cost breakdown.

.2 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.3 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the system is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities include transfer of critical knowledge to facility operational personnel.

.4 The Departmental Representative will issue Interim Acceptance Certificate when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by the Departmental Representative.

.2 Equipment, components and systems have been commissioned.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.

.2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by the Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.5 PRE-CX REVIEW

.1 Before Construction:

.1 Review contract documents, confirm by writing to Departmental Representative.

.1 Adequacy of provisions for Cx.

.2 Aspects of design and installation pertinent to success of Cx.

.2 During Construction:

.1 Co-ordinate provision, location and installation of provisions for Cx.

.3 Before start of Cx:

.1 Have completed Cx Plan up-to-date.

.2 Ensure installation of related components, equipment, sub-systems, systems is complete.

.3 Fully understand Cx requirements and procedures.

.4 Have Cx documentation shelf-ready.

.5 Understand completely design criteria and intent and special features.

.6 Submit complete start-up documentation to Departmental Representative.

.7 Have Cx schedules up-to-date.

.8 Ensure systems have been cleaned thoroughly.

.9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.

.10 Ensure "As-Built" system schematics are available.

.4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00.

.1 Submit no later than 4 weeks after award of Contract:

.1 Name of Contractor's Cx agent.

.2 Draft Cx documentation.

.3 Preliminary Cx schedule.

.2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 4 weeks prior to start of Cx.

.3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 4 weeks prior to start of Cx.

.4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.8 COMMISSIONING DOCUMENTATION

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.

.2 Departmental Representative to review and approve Cx documentation.

.3 Provide completed and approved Cx documentation to Departmental Representative.

1.9 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction schedule.

.2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:

.1 Approval of Cx reports.

.2 Verification of reported results.

.3 Repairs, retesting, re-commissioning, re-verification.

1.10 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage, Departmental Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.

.7 Contractor to ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 STARTING AND TESTING

.1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.12 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days notice prior to commencement.

.2 Departmental Representative to witness of start-up and testing.

.3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

.1 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.2 Integrity of warranties:

.1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.3 Qualifications of manufacturer's personnel:

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

.2 Conduct start-up and testing in following distinct phases:

.1 Included in delivery and installation:

.1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.

.2 Visual inspection of quality of installation.

.2 Start-up: follow accepted start-up procedures.

.3 Operational testing: document equipment performance.

.4 System PV: include repetition of tests after correcting deficiencies.

.5 Post-substantial performance verification: to include fine-tuning.

.3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.

.4 Document required tests on approved PV forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:

.1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.

.2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.

.3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.

.1 Rejected equipment to be removed from site and replaced with new.

.2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

.1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.

.2 Start-up documentation to include:

.1 Factory and on-site test certificates for specified equipment.

.2 Pre-start-up inspection reports.

.3 Signed installation/start-up check lists.

.4 Manufacturer’s and Contractor’s start-up reports,

.5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer, develop written maintenance program and submit Departmental Representative for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.17 TEST RESULTS

.1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

.1 Notify Departmental Representative at least 14 days prior to the start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS / EQUIPMENT

.1 Submit to the Departmental Representative for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

.1 2-way radios.

.2 Ladders.

.3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:

.1 Under actual operating conditions, over entire operating range, in all modes.

.2 On independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

.4 EMCS trending to be available as supporting documentation for performance verification.

1.21 WITNESSING COMMISSIONING

.1 The Departmental Representative is to witness activities and verify results.

1.22 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

.3 Provide copies to the Departmental Representative within 5 days of test and with Cx report.

1.23 EXTENT OF VERIFICATION

.1 Provide manpower and instrumentation to verify up to 30% of reported results, unless specified otherwise in other sections.

.2 Number and location to be at discretion of Departmental Representative.

.3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.

.4 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.

.5 Perform additional commissioning until results are acceptable to the Departmental Representative.

1.24 REPEAT VERIFICATIONS

.1 Assume costs incurred by the Departmental Representative for third and subsequent verifications where:

.1 Verification of reported results fail to receive Departmental Representative approval.

.2 Repetition of second verification again fails to receive approval.

.3 The Departmental Representative deem Contractor's request for second verification was premature.

1.25 SUNDRY CHECKS AND ADJUSTMENTS

.1 Make adjustments and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

1.26 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of the Departmental Representative.

.2 Report problems, faults or defects affecting Cx to the Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from the Departmental Representative.

1.27 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of the Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.28 ACTIVITIES UPON COMPLETION OF COMMISSIONING

.1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.29 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

.1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.30 OCCUPANCY

.1 Cooperate fully with the Departmental Representative during stages of acceptance and occupancy of facility.

1.31 INSTALLED INSTRUMENTATION

.1 Use instruments installed under Contract for TAB and PV if:

.1 Accuracy complies with these specifications.

.2 Calibration certificates have been deposited with Departmental Representative.

.2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.32 PERFORMANCE VERIFICATION TOLERANCES

.1 Application tolerances:

.1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.

.2 Instrument accuracy tolerances:

.1 To be of higher order of magnitude than equipment or system being tested.

.3 Measurement tolerances during verification:

.1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

1.33 OWNER'S PERFORMANCE TESTING

.1 Performance testing of equipment or system by Departmental Representative will not relieve the Contractor from compliance with specified start-up and testing procedures.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Underwriters' Laboratories of Canada (ULC)

1.2 GENERAL

.1 Provide a fully functional facility:

- .1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
- .2 O & M personnel have been fully trained in aspects of installed systems.
- .3 Optimized life cycle costs.
- .4 Complete documentation relating to installed equipment and systems.

.2 Term "Cx" in this section means "Commissioning".

.3 Use this Cx Plan as master planning document for Cx:

- .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
- .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
- .3 Sets out deliverables relating to O & M, process and administration of Cx.
- .4 Describes process of verification of how built works meet Owner design requirements.
- .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
- .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
  - .1 Overview of Cx.
  - .2 General description of elements that make up Cx Plan.
  - .3 Process and methodology for successful Cx.

.4 Acronyms:

- .1 Cx – Commissioning.
- .2 BMM – Building Management Manual.

.3 EMCS – Energy Monitoring and Control Systems.

.4 MSDS – Material Safety Data Sheets.

.5 PI – Product Information.

.6 PV – Performance Verification.

.7 TAB – Testing, Adjusting and Balancing.

.8 WHMIS – Workplace Hazardous Materials Information System.

.5 Commissioning terms used in this section:

.1 Bumping: short term start-up to prove ability to start and prove correct rotation.

.2 Deferred Cx - Cx activities delayed for reasons beyond the Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.3 DEVELOPMENT OF 100% CX PLAN

.1 Cx Plan to be 100% completed by contractor within 2 weeks of award of contract to take into account:

.1 Approved shop drawings and product data.

.2 Approved changes to contract.

.3 Contractor's project schedule.

.4 Cx schedule.

.5 Contractor's, sub-contractor's, suppliers' requirements.

.6 Project construction team's and Cx team's requirements.

.2 Submit completed Cx Plan to the Departmental Representative and obtain written approval.

1.4 REFINEMENT OF CX PLAN

.1 During construction phase, revise, refine and update Cx Plan to include:

.1 Changes resulting from Client program modifications.

.2 Submit each revised Cx Plan to the Departmental Representative for review and obtain written approval.

.3 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.5 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

.1 Contractor to maintain overall responsibility for project and is sole point of contact between members of commissioning team.

.2 Departmental Representative will select Cx team consisting of following members:

.1 The Departmental Representative is responsible for:

.1 Review and approval of all Cx documentation.

.2 Construction team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:

.1 Organizing Cx.

.2 Testing.

.3 TAB.

.4 Performance of Cx activities.

.5 Delivery of training and Cx documentation.

.6 Assigning one person as point of contact with the Departmental Representative for administrative and coordination purposes.

.7 Implementation of Training Plan.

.8 Monitoring operations Cx activities.

.9 Witnessing, certifying accuracy of reported results.

.10 Witnessing and certifying TAB and other tests.

.11 Ensuring implementation of final Cx Plan.

.12 Performing verification of performance of installed systems and equipment.

.3 Contractor's Cx agent implements specified Cx activities including:

.1 Demonstrations.

.2 Training.

.3 Testing.

.4 Preparation, submission of test reports.

1.6 CX PARTICIPANTS

.1 Employ the following Cx participants to verify performance of equipment and systems:

.1 Installation contractor/subcontractor:

.1 Equipment and systems except as noted.

.2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.

.1 To include performance verification.

.3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.

.4 Specialist Cx agency:

.1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.

.5 Client: responsible for intrusion and access security systems.

.6 Ensure that Cx participant:

.1 Could complete work within scheduled time frame.

.2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O M personnel, including:

.1 Modify ventilation rates to meet changes in off-gassing.

.2 Changes to heating or cooling loads beyond scope of EMCS.

.3 Changes to EMCS control strategies beyond level of training provided to O M personnel.

.4 Redistribution of electrical services.

.5 Modifications of fire alarm systems.

.7 Provide names of participants to the Departmental Representative and details of instruments and procedures to be followed for Cx 2 weeks prior to starting date of Cx for review and approval.

1.7 EXTENT OF CX

.1 All new work.

1.8 DELIVERABLES RELATING TO O M PERSPECTIVES

.1 General requirements:

.1 Compile English documentation.

.2 Documentation to be computer-compatible format ready for inputting for data management.

.2 Provide deliverables:

.1 Warranties.

.2 Project record documentation.

.3 Inventory of spare parts, special tools and maintenance materials.

.4 Maintenance Management System (MMS) identification system used.

.5 WHMIS information.

.6 MSDS data sheets.

.7 Electrical panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

1.9 DELIVERABLES RELATING TO THE CX PROCESS

.1 General:

.1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.

.2 Definitions:

.1 Cx as used in this section includes:

.1 Cx of components, equipment, systems, subsystems, and integrated systems.

.2 Factory inspections and performance verification tests.

.3 Deliverables: provide:

.1 Cx specifications.

.2 Startup, pre-Cx activities and documentation for systems, and equipment.

.3 Completed installation checklists (ICL).

.4 Completed product information (PI) report forms.

.5 Completed performance verification (PV) report forms.

.6 Results of Performance Verification Tests and Inspections.

.7 Description of Cx activities and documentation.

.8 Description of Cx of integrated systems and documentation.

.9 Training plans.

.10 Cx Reports.

.11 Prescribed activities during warranty period.

.4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.

.5 Departmental Representative to participate.

1.10 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Items listed in this Cx Plan include the following:

.1 Pre-Start-Up inspections: by the Departmental Representative prior to permission to start up and rectification of deficiencies to the Departmental Representative's satisfaction.

.2 Departmental Representative to use approved check lists.

.3 Departmental Representative will monitor some of these pre-start-up inspections.

.4 Include completed documentation with Cx report.

.5 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by the Departmental Representative and does not form part of Cx specifications.

.6 Departmental Representative will monitor some of these inspections and tests.

.7 Include completed documentation in Cx report.

.2 Pre-Cx activities – FIRE ALARM SYSTEMS

.1 Fire alarm systems: test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements. Departmental Representative has witnessed and certified report, demonstrate devices and zones to Departmental Representative.

1.11 START-UP

.1 Start-up components, equipment and systems.

.2 Departmental Representative to monitor some of these start-up activities:

.1 Rectify start-up deficiencies to satisfaction of the Departmental Representative.

.3 Performance Verification (PV):

.1 Approved Cx Agent to perform.

.1 Repeat when necessary until results are acceptable to Departmental Representative.

.2 Use procedures modified generic procedures to suit project requirements.

.3 The Departmental Representative is to witness and certify reported results using approved PI and PV forms.

.4 Departmental Representative to approve completed PV reports.

.5 The Departmental Representative reserves right to verify up to 50% of reported results at random.

.6 Failure of randomly selected item shall result in rejection of PV report or report of system start-up and testing.

1.12 CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Perform Cx by specified Cx agency using procedures developed by the Contractor and approved by the Departmental Representative.

.2 The Departmental Representative is to monitor Cx activities.

.3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.

.4 The Departmental Representative is to witness, certify reported results of, Cx activities.

.5 The Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

1.13 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

.1 Cx to be performed by specified Cx specialist, using procedures developed by the Contractor and approved by the Departmental Representative.

.2 Tests to be witnessed by the Departmental Representative and documented on approved report forms.

.3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be submitted to the Departmental Representative for review.

.4 The Departmental Representative reserves right to verify percentage of reported results.

.5 Integrated systems to include:

.1 Fire alarm systems.

1.14 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Developed by Contractor and submitted to the Departmental Representative for approval.

1.15 PERFORMANCE VERIFICATION (PV) REPORT

.1 Developed by Contractor and submitted to the Departmental Representative for approval.

1.16 CX SCHEDULES

.1 Prepare detailed Cx Schedule and submit to the Departmental Representative for review and approval same time as project Construction Schedule. Include:

.1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:

.1 Design criteria, design intents.

.2 Pre-TAB review: 14 days after contract award, and before construction starts.

.3 Cx agents' credentials: 14 days before the start of Cx.

.4 Cx procedures: 14 days after award of contract.

.5 Cx report format: 14 days after contract award.

.6 Submission of list of instrumentation with relevant certificates: 14 days before the start of Cx.

.7 Notification of intention to start TAB: 7 days before the start of TAB.

.8 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.

.9 Notification of intention to start Cx: 7 days before the start of Cx.

.10 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 7 days before the start of integrated system Cx.

.11 Identification of deferred Cx.

.12 Implementation of training plans.

.13 Cx reports: immediately upon successful completion of Cx.

.14 Emergency evacuation exercises: after 80% occupancy

.2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to O M personnel.

.3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.

.2 After approval, incorporate Cx Schedule into Construction Schedule.

.3 Contractor, Contractor's Cx agent, and the Departmental Representative will monitor progress of Cx against this schedule.

1.17 CX REPORTS

.1 Submit reports of tests, witnessed to Departmental Representative who will verify reported results.

.2 Include completed and certified PV reports in properly formatted Cx Reports.

.3 Before reports are accepted, reported results to be subject to verification by the Departmental Representative.

1.18 ACTIVITIES DURING WARRANTY PERIOD

.1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:

.1 Full-scale emergency evacuation exercises.

1.19 TRAINING PLANS

.1 Refer to Section 01 91 41

1.20 FINAL SETTINGS

.1 Upon completion of Cx to satisfaction of Departmental Representative lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Commissioning forms to be completed for equipment, system and integrated system.

1.2 INSTALLATION/START-UP CHECK LISTS

.1 Include the following data:

.1 Product manufacturer's installation instructions and recommended checks.

.2 Special procedures as specified in relevant technical sections.

.3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by the Departmental Representative, supplemental additional data lists will be required for specific project conditions.

.3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.

.4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to the Departmental Representative. Check lists will be required during Commissioning.

.5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.3 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment.

.2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative's approval.

1.4 PERFORMANCE VERIFICATION (PV) FORMS

.1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

.2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.

.3 Prior to PV of integrated system, complete PV forms of related systems and obtain Departmental Representative's approval.

1.5 SAMPLES OF COMMISSIONING FORMS

.1 Departmental Representative will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.

.2 Revise items on Commissioning forms to suit project requirements.

.3 Samples of Commissioning forms and a complete index of produced to date will be attached to this section.

1.6 COMMISSIONING FORMS

.1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.

.2 Strategy for use:

.1 Departmental Representative provides Contractor project-specific Commissioning forms with Specification data included.

.2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.

.3 Confirm operation as per design criteria and intent.

.4 Identify variances between design and operation and reasons for variances.

.5 Verify operation in specified normal and emergency modes and under specified load conditions.

.6 Record analytical and substantiating data.

.7 Verify reported results.

.8 Form to bear signatures of recording technician and reviewed and signed off by the Departmental Representative.

.9 Submit immediately after tests are performed.

.10 Reported results in true measured SI unit values.

.11 Provide Departmental Representative with originals of completed forms.

.12 Maintain copy on site during start-up, testing and commissioning period.

1.7 LANGUAGE

.1 To suit the language profile of the awarded contract.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 TRAINEES

.1 Trainees: personnel selected for operating and maintaining this facility. Includes Property Manager, building operators, maintenance staff, security staff, and technical specialists as required.

.2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.2 INSTRUCTORS

.1 Departmental Representative will provide:

.1 Descriptions of systems.

.2 Instruction on design philosophy, design criteria, and design intent.

.2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:

.1 Start-up, operation, shut-down of equipment, components and systems.

.2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.

.3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.

.3 Contractor and equipment manufacturer to provide instruction on:

.1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.3 TRAINING OBJECTIVES

.1 Training to be detailed and duration to ensure:

.1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.

.2 Effective on-going inspection, measurements of system performance.

.3 Proper preventive maintenance, diagnosis and trouble-shooting.

.4 Ability to update documentation.

.5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.4 TRAINING MATERIALS

.1 Instructors to be responsible for content and quality.

.2 Training materials to include:

.1 "As-Built" Contract Documents.

.2 Operating Manual.

.3 Maintenance Manual.

.4 Management Manual.

.5 TAB and PV Reports.

.3 The Departmental Representative, Commissioning Manager and Facility Manager will review training manuals.

.4 Training materials to be in a format that permits future training procedures to same degree of detail.

.5 Supplement training materials:

.1 Transparencies for overhead projectors.

.2 Multimedia presentations.

.3 Manufacturer's training videos.

.4 Equipment models.

1.5 SCHEDULING

.1 Include in Commissioning schedule time for training.

.2 Deliver training during regular working hours, training sessions to be 3 hours in length.

.3 Training to be completed prior to acceptance of facility.

1.6 RESPONSIBILITIES

.1 Be responsible for:

.1 Implementation of training activities.

.2 Coordination among instructors.

.3 Quality of training, training materials.

.2 Departmental Representative will evaluate training and materials.

.3 Upon completion of training, provide written report, signed by Instructors, and witnessed by the Departmental Representative.

1.7 TRAINING CONTENT

.1 Training to include demonstrations by Instructors using the installed equipment and systems.

.2 Content includes:

.1 Review of facility and occupancy profile.

.2 Functional requirements.

.3 System philosophy, limitations of systems and emergency procedures.

.4 Review of system layout, equipment, components and controls.

.5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.

.6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.

.7 Maintenance and servicing.

.8 Trouble-shooting diagnosis.

.9 Inter-Action among systems during integrated operation.

.10 Review of O & M documentation.

.3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

1.8 VIDEO-BASED TRAINING

.1 Manufacturer's videotapes to be used as training tool with the Departmental Representative's review and written approval 3 months prior to commencement of scheduled training.

.2 On-Site training videos:

.1 Videotape training sessions for use during future training.

.2 To be performed after systems are fully commissioned.

.3 Organize into several short modules to permit incorporation of changes.

.3 Production methods to be high quality.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Definitions:

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

.2 CSA Group

.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations

.2 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V

.3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition

.4 Correctional Service Canada (CSC)/Technical Criteria for Correctional Institutions - 2015

.1 Section E – Electrical

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for all fire alarm devices and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit for review fire alarm riser diagram, plan and zoning of building under plexiglass at fire alarm control panel and annunciator.

.4 Shop drawings:

.1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories and other items that must be shown to ensure co-ordinated installation.

.2 Submit 3 copies of 600 x 600 mm minimum size drawings and product data to Departmental Representative.

.3 If changes are required, notify Departmental Representative of these changes before they are made.

.5 Certificates:

.1 Provide CSA/ULC certified equipment and material.

.2 Where CSA certified equipment or material is not available, submit such equipment or material to departmental representative for approval before delivery to site.

.3 Submit test results of installed fire alarm system.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.6 Manufacturer's field reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work as described in PART 3 – FIELD QUALITY CONTROL.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance data: submit operation and maintenance data for all fire alarm devices for incorporation into manual.

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Post instructions where directed.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect all fire alarms devices from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this section.

.5 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification labels for control items in English.

2.2 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from departmental representative before delivery to site and submit such approval as described in PART 1 – ACTION AND INFORMATIONAL SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.3 WARNING SIGNS

.1 Warning signs: in accordance with requirements of the Departmental Representative.

.2 Porcelain enamel signs, minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for copper conductors.

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with labels as follows:

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on labels to be approved by the Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per label.

.5 Labels for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Terminal cabinets and pull boxes: indicate system and voltage.

.7 All junction boxes for fire alarm system to be red in colour.

2.6 WIRING IDENTIFICATION

.1 Maintain phase sequence and colour coding throughout.

.2 Colour coding: to CSA C22.1.

.3 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Fire Alarm	Red

2.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of conditions: verify that conditions of substrate previously installed under other sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative.

.2 Inform the Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Departmental Representative.

3.2 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do fire alarm systems in accordance with CSC-Technical Criteria, Section E-Electrical:
E-7 except where specified otherwise.

3.3 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.4 CONDUIT AND CABLE INSTALLATION

.1 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Control Panels: 1900 mm from top to finished floor.

.2 Fire alarm stations: 1150 mm from middle of device to finished floor.

.3 Fire alarm strobes and horns: 2300 mm min. from top to finished floor.

3.6 FIELD QUALITY CONTROL

.1 Conduct following tests in accordance with Section 01 45 00.

.1 Circuits originating from branch distribution panels.

.2 Systems: fire alarm and communications.

.2 Carry out tests in presence of the Departmental Representative.

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.4 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.7 SYSTEM STARTUP

.1 Instruct the Departmental Representative in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA International

.1 CSA-C22.2 No.18.1-13, Metallic Outlet Boxes, Conduit Boxes and Fittings

.2 CSA-C22.2 No.65-13, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE)

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.3 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and maintenance data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Delivery and acceptance requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and handling requirements:

.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wire and box connectors from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging waste management: remove for reuse and return by manufacturer of pallets, crates padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Clamps or connectors for armoured cable and non-metallic sheathed cable as required to: CSA-C22.2 No.18.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductor cables and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA-C22.2 No.65.

.2 Install fixture type connectors and tighten to CSA-C22.2 No.65. Replace insulating cap.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Electrical General Requirements

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

1.2 REFERENCES

.1 InterNational Electrical Testing Association

.1 ANSI/NETA ATS Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems, 2015 edition

.2 Canadian Standards Association (CSA)

.1 CSA-C22.2 No. 232 –17, Optical Fiber Cables

1.3 PRODUCT DATA

.1 Provide product data in accordance with Section 01 33 00.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove and return packaging materials in accordance with Section 01 74 20.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Jacketted.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00.

.2 Conductors:

.1 Grounding conductor: copper, as indicated.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Cross-linked polyethylene XLPE.

.2 Rating: 600V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride

.7 Teck cables in outdoor locations to be UV approved.

.8 Teck cables in riser applications shall be riser rated.

.9 Fastenings:

.1 One hole malleable iron straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables.

.3 Threaded rods: 6 mm diameter to support suspended channels.

.10 Connectors:

.1 Watertight, approved for TECK cable.

2.3 MINERAL-INSULATED CABLES

.1 Conductors: solid bare soft-annealed copper, size as indicated.

.2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.

.3 Outer covering: annealed seamless copper sheath, Type M1 rated 600 V, 250°C.

.4 Overall jacket: none.

.5 Two-hour fire rating.

.6 Connectors: watertight, factory installed and tested, approved for MI cable.

.7 Termination kits: field installed approved for MI cable

2.4 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors: anti short connectors.

2.5 FIRE ALARM CABLES

.1 Conductors: insulated, copper, sized as indicated, rated for 300V.

.2 Conductor sizes: minimum No. 16 AWG.

2.6 OPTICAL-FIBER CABLES

.1 Stands to CSA-C22.2 No. 232.

.2 Type: 6 strand multi-mode, 50/125 micron fiber optic cable, outdoor direct burial rated, tight buffer.

.3 Jacket: Flame retardant, chemical and sunlight resistant black PVC.

Part 3 Execution

3.1 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20.

.2 Cable Colour Coding: to Section 26 05 00.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e., common neutrals not permitted.

.7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.2 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34.

3.3 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable exposed, securely supported by straps.

3.4 INSTALLATION OF FIRE ALARM CABLE

.1 Group cables wherever possible on channels.

.2 Install cable exposed, securely supported by straps.

.3 Exposed cable in finished spaces not permitted.

.4 Splices not permitted.

3.5 INSTALLATION OF OPTICAL-FIBERCABLES

.1 Install cable exposed, securely supported by straps.

.2 Support 2-hour fire rated cables at 1 m intervals.

3.6 INSTALLATION OF MINERAL-INSULATED CABLES

.1 Install cable exposed, securely supported by straps.

.2 Support 2-hour fire rated cables at 1 m intervals.

.3 Make cable terminations by using factory-made kits.

.4 Cable terminations: use thermoplastic sleeving over bare conductors.

.5 Where cables are buried in cast concrete or masonry, sleeve for entry of cables.

.6 Do not splice cables unless indicated.

3.7 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

3.8 FIELD QUALITY CONTROL

.1 Perform tests on all existing cables being re-used and connected to new distribution equipment and all new cables installed within the scope of the project.

.1 Include necessary instruments and equipment.

.2 Inspect exposed sections of cable for physical damage and correction connection in accordance with the single-line diagram.

.3 Inspect bolted electrical connections for high resistance using low-resistance ohmmeter or by calibrated torque-wrench method in accordance with ANSI/NETA ATS.

.4 Inspect compression-applied connectors for correct cable match and indentation.

.5 Inspect cable jacket insulation and condition.

.6 Acceptance tests:

.1 Before terminating cables, perform insulation resistance test on each conductor with respect to ground and adjacent conductors with 1000 V megger on each phase conductor. Test duration shall be one minute.

.2 Check insulation resistance after each termination.

.3 Perform continuity tests to ensure correct cable connection.

.4 Verify uniform resistance of parallel conductors.

.7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

.9 Perform tests before energizing electrical system.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Electrical General Requirements

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-2015, Canadian Electrical Code Part I (23rd edition), Safety Standard for Electrical Installation

1.3 SUMBITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product data:

.1 Provide manufacturer's printed product literature, specifications and datasheets and include product characteristics, performance criteria, physical size, finish and limitations.

Part 2 Products

2.1 JUNCTION AND PULL BOXES

.1 Connection: welded sheet steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

Part 3 Execution

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Install additional pull boxes as required by CSA C22.1 Section 12. Mount cabinets with top not higher than 2m above finished floor except where impractical.

.3 Secure equipment to poured concrete with expandable inserts.

.4 Support boxes independently of connecting conduits.

.5 Vacuum clean interior of boxes prior to installation of cables / terminations.

3.2 IDENTIFICATION

.1 Equipment identification to Section 26 05 00.

.2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No. 18.3-12, Conduit, Tubing, and Cable Fittings (Tri-National Standard, with ANCE NMX-J-017 and UL514B)

.2 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

.1 Submit cable manufacturing data.

.3 Quality assurance submittals:

.1 Test reports: submit certified test reports.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 20.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

2.2 CONDUIT FASTENINGS

.1 One hole malleable iron straps to secure surface conduits 50 mm and smaller.

.1 Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1 m on centre.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.
Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Set-screws acceptable for EMT; use watertight connectors and couplings where required.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms and unfinished areas.

.3 Surface mount conduits except in finished areas.

.4 Use electrical metallic tubing (EMT) except in cast concrete, above 2.4 m not subject to mechanical injury.

.5 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than 1/10th 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 Run 2-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel.

.1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.

.10 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.11 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel.

.1 Install in centre one third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Install sleeves where conduits pass through slab or wall.

.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.

.1 Use cold mastic between sleeve and conduit.

.5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.

.6 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.7 Organize conduits in slab to minimize cross-overs.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 National Research Council Canada (NRC)

.1 National Building Code of Canada 2015 (NBC)

.2 Treasury Board of Canada Secretariat (TBS), Occupational Safety and Health (OSH)

.1 Fire Protection Standard-14

.3 Canada Standard Association (CSA)

.1 CSA B44-16, Safety Code for Elevators and Escalators

.4 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S524-14, Standard for the Installation of Fire Alarm Systems

.2 CAN/ULC-S525-16, Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories

.3 CAN/ULC-S526-16, Visible Signal Devices for Fire Alarm Systems, Including Accessories

.4 CAN/ULC-S527-14, Standard for Control Units for Fire Alarm Systems

.5 CAN/ULC-S528-14, Manual Stations for Fire Alarm Systems, Including Accessories

.6 CAN/ULC-S529-16, Smoke Detectors for Fire Alarm Systems

.7 CAN/ULC-S530-91(R1999), Heat Actuated Fire Detectors for Fire Alarm Systems

.8 CAN/ULC-S537-13, Standard for the Verification of Fire Alarm Systems

.5 Correctional Services Canada (CSC) Technical Criteria – Section E -Electrical, E-7

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for multiplex fire alarm system and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

.2 Indicate on shop drawings:

.1 Detail assembly and internal wiring diagrams for control units.

.2 Overall system riser identifying signaling circuits, initiating zones, control equipment; identifying terminations, terminal numbers, conductors and raceways.

.3 Details for devices.

.4 Details and performance specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.

.5 Step-by-step operating sequence, cross referenced to logic flow diagram.

.3 Indicate on shop drawings: design data – power calculations:

.1 Detail assembly and internal wiring diagrams for control units. Submit design calculations new work specified to substantiate that battery capacity exceeds supervisory and alarm power requirements.

.2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes.

.3 Show comparison of notification appliance circuit alarm power requirements with rated circuit power output.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance data: submit operation and maintenance data for fire alarm system for incorporation into manual.

.3 Include:

.1 Instructions for complete fire alarm system to permit effective operation and maintenance.

.2 Technical data – illustrated parts lists with parts catalogue numbers.

.3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.

.4 List of recommended spare parts for system.

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit maintenance materials in accordance with Section 01 78 00.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with section with manufacturer's written instructions, Section 01 61 00.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors, off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse of padding, pallets, crates, packaging materials as specified in Construction Waste Management Plan and Waste Reduction Workplan in accordance with Section 01 74 20.

Part 2 Products

2.1 GENERAL

.1 The system supplied under this specification shall utilize node-to-node, direct wired, multi-priority peer-to-peer network operations. The system shall utilize electronically addressed, smoke detectors, heat detectors and input/output modules as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, LCD/LED annunciation nodes, and workstations. Each node is an equal, active functional member of the network, which is capable of making all local decisions and generating network tasks to other nodes in the event of node failure or communications failure between nodes.

.2 All integrated life safety system equipment shall be arranged and programmed to provide an integrated system for the early detection of fire, the notification of building occupants, the override of the HVAC system operation, and the activation of other auxiliary systems to inhibit the spread of smoke and

fire, and to facilitate the safe evacuation of building occupants. In all operating modes, the processing of fire alarms shall have the highest priority.

2.2 CIRCUITING GUIDELINES

.1 Each addressable analog loop shall be circuited so device loading is not to exceed 80% of loop capacity in order to allow for the addition of future devices.

.2 Initiating device circuits monitoring manual fire alarm stations, smoke and heat detectors, and valve supervisory switches shall be wired as Class A.

.3 All alarm output circuits shall be wired as Class B. All alarm output circuits shall have a minimum circuit output rating of: 2 amps @ 24 VDC; The notification circuits shall be power limited. Non-power limited circuits are not acceptable.

.4 Each of the following types of alarm notification appliances shall be circuited as shown on the drawings but shall be typically as follows:

.1 Audible signals provide sufficient spare capacity to assure that the addition of five (5) audible devices can be supported without the need for additional control components (power supplies, signal circuit modules, batteries, etc.).

.2 Visual signals provide sufficient spare capacity to assure that the addition of three (3) audible devices can be supported without the need for additional control components (power supplies, signal circuit modules, batteries, etc.).

2.3 FIRE ALARM SYSTEM SEQUENCE OF OPERATION

.1 The system shall identify any off normal condition and log each condition into the system database as an event.

.1 The system shall automatically display on the control panel Liquid Crystal Display the first event of the highest priority by type. The priorities and types shall be alarm, supervisory, trouble, and monitor.

.2 The system shall have a Queue operation, and shall not require event acknowledgment by the system operator. The system shall have a labeled color coded indicator for each type of event; alarm – red, supervisory – yellow, trouble – yellow, monitor – yellow. When an unseen event exists for a given type, the indicator shall be lit.

.3 For each event, the display shall include the current time, the total number of events, the type of event, the

time the event occurred and up to a 42 character custom user description.

.4 The user shall be able to review each event by simply selecting scrolling keys (up-down) for each event type.

.5 Upon acknowledging or silencing any event at the control panel, any new alarm, supervisory, or trouble events shall re-sound at the control panel.

.2 Operation of any alarm initiating device shall automatically:

.1 Update the control/display as described above (Section 2.3.1.1.)

.2 Sound all audible appliances in a Temporal-3-3-3 Pattern. ALL AUDIBLE APPLIANCES SHALL BE SYNCHRONIZED WITH EACH OTHER WHEN TWO OR MORE HORNS CAN BE HEARD. Audible devices shall have the ability to be silenced.

.3 Activate all strobe appliances throughout the facility. ALL STROBE APPLIANCES SHALL BE SYNCHRONIZED WITH EACH OTHER IN ANY LOCATION WITH TWO OR MORE DEVICES IN A COMMON FIELD OF VIEW. Visual devices shall be non-silenced unless the system is successfully reset.

.4 Operate control relay contacts to shutdown all HVAC units serving the floor of alarm initiation.

.5 Operate control relay contacts to return elevators to floor of egress, or to alternate floor, as required.

.6 Operate control relay contacts to release all magnetically held smoke doors throughout the building.

.7 Visually annunciate the individual point of alarm on all remote annunciator panels. The visual indication shall remain on until the alarm condition is reset to normal.

.8 When the smoke detectors on the ranges in the living units show up as trouble, the troubles need to show in a colour other than yellow which is used for general troubles.

.9 When a smoke detector with a sounder base on a range activates the alarm will only sound on the affected range. To have the entire building sound, it will require a second device without a sounder base e.g. standard smoke, heat detector or sprinkler head activation.

.3 Actuation of any supervisory device to:

.1 Cause electronic latch to lock in supervisory state at central control unit (and data gathering panels/transponders where installed).

.2 Indicate respective supervisory zone at central control unit and remote annunciator panels.

.3 Cause audible signal at central control unit to sound.

.4 Activate common supervisory sequence.

.4 Elevator smoke and heat detector sequences shall comply with local, provincial and CSA B44 requirements for main/alternate floor recalls, and shunt trip activations.

.5 The entire fire alarm system wiring shall be electrically supervised to automatically detect and report trouble conditions to the fire alarm control panel. Any opens, grounds or disarrangement of system wiring and shorts across alarm signaling wiring shall automatically:

.1 Update the control/display as described above (1.1.)

.2 Visually and audibly annunciate a general trouble condition, on the remote annunciator panels. The visual indication shall remain on until the trouble condition is repaired.

2.4 MATERIALS

.1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.

.2 Power supply: to CAN/ULC-S524.

.3 Audible signal devices: to CAN/ULC-S525.

.4 Visual signal devices: to CAN/ULC-S526.

.5 Control unit: to CAN/ULC-S527.

.6 Manual pull stations: to CAN/ULC-S528.

.7 Smoke detectors: to CAN/ULC-S529.

.8 Thermal detectors: to CAN/ULC-S530.

.9 Regulatory Requirements:

.1 To TBS Fire Protection Standard.

.2 System components: listed by ULC and comply with applicable provisions of NBC, and meet requirements of local authority having jurisdiction.

2.5 GENERAL EQUIPMENT & MATERIALS

.1 All equipment and components shall be new, and the manufacturer's current model. The materials, equipment and devices shall have been tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signalling Fire Alarm System.

.2 All equipment and components shall be installed in strict compliance with the manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before

beginning system installation. Refer to the riser/connection diagram for all specific system installation, termination and wiring data.

.3 All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place. Fasteners and supports shall be adequate to support the required load.

.4 All active field devices connected to the control unit shall be manufacturer listed as compatible with the control unit as per CAN/ULC-S527 requirements.

.5 The following is a list of devices that are required to be compatible with the control unit and include but not limited to:

.1 Manual stations: singe stage.

.2 Spot type smoke detectors: photo-electronic.

.3 Spot type heat detectors: rate of rise and fixed temperature combination type.

.4 Visible strobe signalling devices: wall and/or ceiling mounted type.

.5 Electronic horns.

2.6 GENERAL SYSTEM PERFORMANCE REQUIREMENTS

.1 The life safety control system is capable of expansion to support the following:

.1 Up to six (6) intelligent analog loops hosting as many as 1,500 signature series devices.

.2 Two hundred fifty (250) addressable devices per loop.

.3 10-amp power supply with universal 94 to 264 VAC input voltage.

.2 The system shall be capable of full system wide annunciation regardless of the number of addressable devices.

.3 The system shall include a full-featured operator interface control and annunciation panel. The system shall include a back-lit large graphic liquid crystal display and queue, individual, colour coded system status LEDs, and an alphanumeric keypad for the field programming and control of the Fire Alarm System.

.4 All programming or editing of the existing program in the system shall be achieved by an authorized factory trained technician using the programming facility and lap top computer, capable of immediate downloading of all new and or changed status for storage, reference and back up.

2.7 SYSTEM OPERATION

.1 Provide complete, electrically supervised, code 3 temporal common coded, manual, zoned, annunciated, fire alarm system.

.2 Transmission of signals from more than one zone over common circuit to control panel is permitted.

.3 Single stage operation. Operation to actuation following:

.1 Manual station.

.2 Heat detector.

.3 Smoke detector.

.4 Actuation of single operation device to initiate following:

.1 Building evacuation alarm devices to operate continuously.

.2 Zone of alarm device to be indicated on control panel and remote annunciator.

.3 Ventilating fans to shut down or to function so as to provide required control of smoke movement.

.4 Fire doors and smoke control doors if normally held open, to close automatically.

.5 Electro-magnetic door holders to de-energize.

.6 Operations to remain in alarm mode (except alarm notification appliances if manually silenced) until system is manually restored to normal.

.7 Power-assisted fire door opening devices to disconnect.

2.8 TROUBLE ON THE SYSTEM SHALL

.1 Indicate circuit in trouble at the Display and Control Centre, LCD Annunciator, and /or Control Unit

.2 Activate "system trouble" indication, buzzer and common trouble sequence as per manufacturer requirements.

.3 Acknowledging trouble condition shall silence the local DCC or annunciator audible indication; whereas visual indication shall remain until trouble is cleared and system is reset back to normal.

.4 Trouble on system shall be suppressed during the course of an alarm condition.

.5 Trouble condition on any fire alarm circuit in system shall not initiate an alarm condition.

2.9 ELEVATOR RECALL OPERATION

.1 For elevator recall operation provide two sets of separate contacts for elevator capture:

.1 Contacts for return to main floor of egress.

.2 Contact to return to alternate floor of egress.

.2 Provide early warning spot type smoke detection in each elevator lobby throughout the building to operate elevator recall operation.

.3 Conform to manufacturer requirements for elevator recall as well as CSA-B44.

2.10 MEDIUM SCALE CONTROL PANEL

.1 The fire alarm control panel or panels and all system devices (horn-strobes, strobes, pull stations, smoke and heat detectors, etc.) shall be Signature series and Genesis series, all under one label "ULC listed and approved" for the use of fire alarm systems. The operating controls shall be located behind locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified.

.2 System Controllers: The main controller SFS1-CPU shall be supervised, site programmable, and of modular design supporting up to 125 detectors and 125 remote modules per addressable Signaling Line Circuit (here in referred to as SLC). The CPU shall support up to 6 SLC's per panel for a total system capacity of 1,500 Intelligent Addressable points. The system shall be designed with peer-to-peer networking capability for enhanced survivability, with support for up to 8 nodes, each with up to 1,500 points and an overall capacity of 12,000 points.

.3 The system shall store all basic system functionality and job specific data in non-volatile memory. All site specific and operating data shall survive a complete power failure intact. Passwords shall protect any changes to system operations.

.4 The Main Controller Module shall control and monitor all local or remote peripherals. It shall include a large 960 character 8 event LCD display with rotary dial "Speed Touch" command and control, power supply, and support remote LCD and zone display annunciators, printers, and support communication interface standard protocol (CSI) devices such as color computer annunciators and color graphic displays. If configured as a network, each control panel shall display each and every point in the system (node) and shall also support up to 30 remote LCD display annunciators. Remote LCD annunciators shall also display each and every point in the system.

.5 The system shall have built-in automatic system programming to automatically address and map all system devices attached to the main controller. A minimum default single stage alarm system operation shall be supported with alarm silence, event silence, drill, lamp test, and reset common controls. The system shall be programmable for single, 2-stage or staged evacuation operation.

.6 Advanced Windows-based System Definition Utility with Program Version Reporting to document any and all changes made during system start-up or system commissioning shall be used to maintain site specific programming. Time and Date Stamps of all modifications made to the program must be included to allow full retention of all previous program version data. It shall support programming of any input point to any output point. The system shall support the use of Bar Code readers to assist custom programming functions. It shall allow authorized customization of fundamental system operations using initiating events to start actions, timers, sequences and logical algorithms. The system program shall meet the requirements of this project, current codes and standards, and satisfy the local Authority Having Jurisdiction.

.7 The system shall support distributed processor intelligent detectors with the following operational attributes: integrated multiple differential sensors; automatic device mapping; electronic addressing; environmental compensation; pre-alarm, dirty detector identification; automatic day/night sensitivity adjustment; normal/alarm LEDs; relay bases; sounder bases; and isolator bases.

.8 The system shall use full digital communications to supervise all addressable loop devices for placement, correct location, and operation. It shall allow swapping of “same type” devices without the need of addressing and impose the “location” parameters on replacement device. It shall initiate and maintain a trouble if a device is added to a loop and clear the trouble when the new device is mapped and defined into the system.

.9 Each controller shall contain a RS232 printer/programming port for programming locally via a personal Computer. When operational, each controller shall support a printer through the RS232 port and be capable of message routing.

.10 Single stage operation shall be programmable.

.11 The system shall have a ULC Listed Detector Sensitivity test feature, which will be a function of the smoke detectors and performed automatically every 4 hours.

.12 The system shall support 100% of all remote devices in alarm and provide support for a 100% compliment of detector isolator bases.

.13 All panel modules shall be supervised for placement and initiate a system trouble if damaged or removed.

.14 The system shall have a CPU watchdog circuit to initiate trouble should the CPU fail.

.15 The default system evacuation signal rate shall be temporal 3-3-3.

.16 Audible notification appliances shall be affected by signal silence features. Visual signal appliance shall not be affected by signal silence features.

.17 User Interface: The 4X-LCD Display Module shall be of membrane style construction with a 240 x 340 pixel 24 line by 40-character (960 total characters) Liquid Crystal Display (LCD). The LCD shall use ¼ VGA super-twist technology with backlighting for high contrast visual clarity and a colored gray/black and white display. In the normal mode, the LCD shall display the time, a customer facility name, and the number of history events. In the alarm mode, the LCD display the total number of events and the type of event on display. The LCD shall reserve 42 characters of display space for each user custom message by addressable device. The module shall have visual indicators for the following common control functions; Alarm, Disable, Supervisory (SUP), Ground Fault, CPU Fail, Trouble, and Power. There shall be common control keys and visual indicators for Acknowledge, Alarm Silence, Panel Silence, and reset. A rotary select switch shall be available to scroll through a 1,100 event history buffer. The LCD shall display the first event of the highest priority as well as the previous seven (7) alarm events “hands free” in chronological order so that the arriving firefighter may track the fires progression. Provide system function keys; status, reports, enable, disable, activate, restore, program, and test.

.18 NAC circuit runs, more devices and/or use of smaller gauge wire.

.19 Each control panel shall support a standard 10/100 Base-T Ethernet network connection for panel programming and diagnostics.

.20 Remote Serial LCD Annunciator, EST R Series. The Remote Serial LCD annunciators shall display each and every point on the panel it is connected to and be sized with the same number of characters as in the main FACP display. Annunciators not capable of displaying each point on that panel will not be considered equal. Grouping points to “zones” will not be acceptable. Remote LCD Annunciator: shall have LCD display functions for alarm, supervisory, and trouble indications and common system controls including; acknowledge/silence, signal silence, reset, drill, and lamp test. Annunciator must support a 24 LED expander and be complete with control display modules with printed zone labels. Shall be housed in a metal enclosure with key lock door.

.21 The system shall be complete with EST3 control display modules with print labels to provide the emergency user with the simplest interfaces, lights and switch control at main control panel and remote annunciator panel.

2.11 LARGE SCALE CONTROL PANEL

.1 The control panel(s) shall be a multi-processor based networked system designed specifically for fire, one-way and two-way emergency audio communications, smoke control. The control panel shall be listed and approved as one system for the application standard(s) as listed under the General section. The control panel shall include all required hardware, software and site specific system programming to provide a complete and operational system. The control panel(s) shall be designed such that interactions between any application can be configured, and modified using software provided by a single supplier. The control panel(s) operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel. Each node of the control panel shall include the following capacities:

.1 Support up to 2500 analog/addressable points.

.2 Support up to 124 LCD keypad annunciator displays.

.3 Support digital dialers and modems.

.4 Support multiple communication ports and protocols.

.5 Support up to 1740 chronological events.

.2 Networking: up to 64 control panels may be networked together for increased capacity up to a total of 160,000 addressable devices. The network of control panels shall include the following features:

.1 Ability to download all network applications and firmware from the configuration computer through a single location on the system.

.2 Provide electronic addressing of analog/addressable devices.

.3 Provide an operator interface control/display that shall annunciate, command and control system functions.

.4 Provide an internal audible signal with different programmable patterns to distinguish between alarm, supervisory, trouble and monitor conditions.

.5 Provide a discreet system control switch provided for reset, alarm silence, panel silence, drill switch, previous message switch, next message switch and details switch.

.6 Provide system reports that include detailed description of the status of system parameters for corrective action or for preventative maintenance programs. Reports shall be displayed by the operator interface or capable of being printed on a printer.

.7 Provide an authorized operator with the ability to control or modify system functions like system time, date, passwords, holiday dates, restart the system and clear control panel event history file.

.8 Provide an authorized operator to perform test functions within the installed system.

.3 Annunciation: Alphanumeric Display and System Controls – arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, monitor, trouble and component status messages and control menu.

.1 The common control switches with corresponding LED's provided as minimum will be: Reset; Alarm Silence; Panel Silence; and Drill. It shall be able possible to add additional switches/LEDs as required.

.2 The main control panel shall have a display that is a 24 lines by 40 character graphic LCD and backlit when active.

.3 Each point shall have a custom event message of up to 40 charters, for a total of 80 characters. In addition, instructional text messages shall be supported with a maximum of 2,000 characters each.

.4 Provide 8 simultaneous events to be displayed. The first seven (7) highest priority events in addition to the most recent event. The events shall be automatically placed in event types (Alarm, Supervisory, Monitor & Trouble) for easy access and it shall be possible to view the specific event type separately. Having to scroll through a mixed list of event types is not acceptable.

.5 Provide an internal audible signal with different programmable patterns to distinguish between alarm, supervisory, trouble and monitor conditions.

.6 This display shall be an EST 3-LCDXL1.

.7 Systems not capable of such a display on the main panel faceplate shall include a CRT/Monitor display meeting the above requirements and battery stand-by.

.8 Shall be complete with EST3 display modules with print labels to provide the emergency user with the simplest

interfaces, lights and switch control at main control panel and remote annunciator panel.

2.12 POWER SUPPLIES

.1 Fire Alarm systems shall be supplied by essential power source.

.2 Fire alarm systems shall be arranged so that in the event of failure of the main power supply, the system shall switch automatically to the stand-by or auxiliary supply.

.3 The fire alarm system shall monitor and record on its printer the loss and return of the AC supply and the return of its DC supply and provide annunciation at the central control panel and MCCP.

.4 Fire alarm systems shall be provided with a 24V DC power supply consisting of gel cell type rechargeable batteries with charging means so arranged as to automati-cally maintain the batteries in a fully charged condition.

.5 The battery shall be sized to support the system for 24 hours of supervisory and trouble signal current, plus full alarm operation:

.1 Not less than one (1) hour for buildings classified as Group B major occupancy.

.2 Thirty (30) minutes for other buildings.

2.13 INITIATING/INPUT CIRCUITS

.1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors and water flow switches, wired in DCLA configuration to central control unit.

.2 Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.

.3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".

.4 Receiving circuits for supervisory, N/O devices. Devices: wired in DCLA configuration to central control unit.

.5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

2.14 ALARM OUTPUT CIRCUITS

.1 Alarm output circuit: connected to signals, wired in class B configuration to central control unit.

.1 Signal circuits' operation to follow system programming; capable of sounding bells/horns continuously in a temporal pattern. Each signal circuit: rated at 2 A, 24 VDC; fuse-protected from overloading/overcurrent.

.2 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.

2.15 AUXILIARY CIRCUITS

.1 Auxiliary contacts for control functions.

.2 Actual status indication from controlled device.

.3 Alarm, trouble and supervisory on system to cause operation of programmed auxiliary output circuits.

.4 2 sets of separate contacts for elevator capture to main floor of egress and to alternate floor of egress.

.5 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.

.6 Fans: stagger-started upon system reset; timing circuit to separate starting of each fan or set of fans connected to auxiliary contact on system.

.1 Timing circuit: controlled by CCU.

.7 Auxiliary circuits: rated at 2 A, 24 Vdc or 120 Vac, fuse-protected.

2.16 INITIATING DEVICES

.1 Intelligent Devices — General: Each remote device shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Each device shall store as required for its functionality the following data: device serial number, device address, device type, personality code, date of manufacture, hours in use, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, job/project number, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller. Each device shall be capable of electronic addressing, either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location. Setting a device’s address by physical means shall not be accepted.

.2 Intelligent Detectors — General: It shall be possible to address each Intelligent Signature Series detector without the use of mechanical (DIP or rotary) switches. Devices using mechanical switches for addressing shall not be acceptable. The System Intelligent Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing

independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters. Devices not capable of combining different fire parameters or employing digital filters shall not be acceptable. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and analog loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total analog loop response time for detectors changing state shall be 0.5 seconds. Each detector shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the analog loop controller. A red LED shall flash to display alarm status. The detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient “Environmental Thresholds” approximately six times an hour. The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminates as well as detector aging. The process shall employ digital compensation to adapt the detector to both 24-hour long term and 4-hour short-term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the “learned” base line sensitivity. The base line sensitivity information shall be updated and permanently stored at the detector approximately once every hour. The intelligent analog detectors shall be suitable for mounting on any Signature Series detector mounting base.

.3 The intelligent Analog detectors shall be suitable for mounting on any Signature Series detector-mounting base.

.4 Fixed Temperature Heat Detector: Provide intelligent fixed temperature heat detectors (SIGA2-HFS). The heat detector shall have a Low Mass thermistor heat sensor and operate at a fixed temperature. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The heat detector shall have a nominal alarm point rating of 135°F (57°C). The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

.5 Fixed Temperature/Rate of Rise Heat Detector: Provide intelligent combination fixed temperature/rate-of-rise heat detectors (SIGA2-HRS). The heat detector shall have a Low Mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135°F (57°C) and a rate-of-rise alarm point of 15°F (9°C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

.6 Photoelectric Smoke Detector: Provide intelligent photoelectric smoke detectors (SIGA2-PS). The smoke detector shall be modular and allow for replacement of the photoelectric chamber, should the detector become dirty enough to require it. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC. The photo detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications. The percent smoke obscuration per foot alarm set point shall be

field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%. The photo detector shall be suitable for operation in the following environment:

.1 Temperature: 32°F to 120°F (0°C to 49°C).

.2 Humidity: 0-93% RH, non-condensing.

.3 Elevation: no limit.

.7 Standard Detector Mounting Bases, SIGA-SB / SIGA-SB4: Provide standard detector mounting bases (SIGA-SB or SIGA-SB4 as required). The base shall, contain no electronics, support all Signature Series detector types and have the following minimum requirements:

.1 Removal of the respective detector shall not affect communications with other detectors.

.2 Terminal connections shall be made on the room side of the base. Bases that must be removed to gain access to the terminals shall not be acceptable.

.3 The base shall be capable of supporting one (1) Signature Series (SIGA- LED) Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.

.8 Relay Detector Mounting Bases, SIGA-RB/SIGA-RB4: Provide relay detector mounting bases (SIGA-RB or SIGA-RB4 as required). The relay base shall support all Signature Series detector types and have the following minimum requirements:

.1 The relay shall be a bi-stable type and selectable for normally open or normally closed operation.

.2 The position of the contact shall be supervised.

.3 The detector processor upon power up shall exercise the relay operation.

.4 The relay shall automatically de-energize when a detector is removed.

.5 Its respective detector processor shall control the operation of the relay base. Detectors operating standalone mode shall operate the relay upon changing to alarm state. Relay bases not controlled by the detector microprocessor shall not be acceptable.

.6 Form “C” Relay contacts shall have a minimum rating of 1 amp @ 30 VDC and be listed for “pilot duty”.

.7 Removal of the respective detector shall not affect communications with other detectors.

.8 Terminal connections shall be made on the room side of the base. Bases that must be removed to gain access to the terminals shall not be acceptable.

.9 Isolator Detector Mounting Bases: Provide isolator detector mounting bases as required per plans and specs (SIGA-IB or SIGA-IB4). Its respective detector processor shall control the operation of the isolator base. Isolators that are not controlled by a detector processor shall not be accepted. Following a short circuit condition, each isolator/detector shall be capable of performing an internal self-test procedure to re-establish normal operation. Isolator/detectors not capable of performing independent self-tests shall not be acceptable. The isolator base shall support all Signature Series Detector types and have the following minimum requirements:

.1 The isolator shall operate within a minimum of 23 msec. of a short circuit condition on the communication line.

.2 When connected in Class A configuration the Signature Loop Controller shall identify an isolated circuit condition and provide communications to all non-isolated analog devices.

.3 Terminal connections shall be made on the room side of the base. Bases that must be removed to gain access to the terminals shall not be acceptable.

.10 Duct Detector Housing, SIGA-DH: Provide model SIGA-DH Low profile intelligent addressable DUCT smoke detector as indicated on the project plans. Provide for variations in duct air velocity between 100 and 4,000 feet (30 and 1219 meter) per minute and include a wide sensitivity range of .79 to 2.46%/ft. (2.59 to 8.07%/meter) Obscuration.

.11 Intelligent Modules — General: It shall be possible to address each Intelligent Signature Series module without the use of mechanical (DIP or rotary) switches. Devices using mechanical switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Modules requiring EPROM, PROM, ROM changes or DIP switch and/or jumper changes shall not be acceptable. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment: Temperature: 32°F to 120°F (0°C to 49°C), Humidity: 0-93% RH, non-condensing.

.12 Single Input Module, SIGA-CT1 (Waterflow Detectors, Tamper Switches etc.): Provide intelligent single input modules SIGA-CT1. The Single Input Module shall provide one (1) supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" (102mm) square boxes with 1-gang covers. The single input module shall support the following circuit types: Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.), Normally-Open Alarm Delayed Latching (Waterflow Switches), Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.), Normally-Open Active Latching (Supervisory, Tamper Switches).

.13 Dual Input Module, SIGA-CT2: Provide intelligent dual input modules SIGA-CT2. The Dual Input Module shall provide two (2) supervised Class B input circuits each capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" deep 1-gang boxes and 1 ½" (38mm) deep 4" (102mm) square boxes with 1-gang covers. The dual input module shall support the following circuit types: Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.), Normally-Open Alarm Delayed Latching (Waterflow Switches), Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.), Normally-Open Active Latching (Supervisory, Tamper Switches).

.14 Control Relay Module, SIGA-CR: Provide intelligent control relay modules SIGA-CR. The Control Relay Module shall provide one form "R" dry relay contact rated at 2 amps @ 24 VDC to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" (102mm) square boxes with 1-gang covers.

.15 Intelligent Manual Pull Stations — General: It shall be possible to address each Signature Series fire alarm pull station without the use of mechanical (DIP or rotary) switches. Devices using mechanical switches for addressing shall not be acceptable. The manual stations shall have a minimum of 2 diagnostic LEDs mounted on their integral, factory assembled single or two stage input module. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The station shall be capable of storing up to 24 diagnostic codes that can be retrieved for troubleshooting assistance. Input circuit wiring shall be supervised for open and ground

faults. The fire alarm pull station shall be suitable for operation in the following environment: Temperature: 32°F to 120°F (0°C to 49°C), Humidity: 0-93% RH, non-condensing.

.16 Manual Pull Station, SIGA-270B: Provide intelligent single action, single stage fire alarm stations SIGA-270B. The fire alarm station shall be of metal construction with an internal toggle switch. Provide a locked test feature. Finish the station in red with silver "PULL IN CASE OF FIRE" English lettering. The manual station shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes.

2.17 SIGNAL DEVICES

.1 General:

.1 All devices which are supplied for the requirements of this specification shall be ULC Listed.

.2 All devices shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturer's instructions

.3 Any devices that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purpose intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purpose intended.

.2 Self-Synchronized Horns and Strobes

.1 Provide electronic horn/strobes.

.2 Horn and strobe power shall be provided on one pair of wires. It shall be possible to control the horn (on, off and coded) independently from the strobe.

.3 The horn shall be selectable for continuous or synchronized temporal operation. The strobe shall be selectable for a continuous or temporal synchronized flash rate to match the horn and meet the intent of the National Building Code, Division B, Appendix Clause 3.2.4.20 (1).

.4 The horn shall provide an output of 94 dB peak using a low frequency tone for superior wall penetration.

.5 The strobe output shall be synchronized and available in 15, 30, 60, 75 &110 candela (cd) as listed on the plans. The light output shall be an even "Full Light" pattern throughout the strobes protected area. Strobes

utilizing a traditional specular reflector with uneven light distribution are not acceptable.

.6 The horn/strobe shall be an ultra low profile single gang design, finished in UV stable textured red and shall not protrude more than 1" (25mm) from the wall.

.7 All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed. The devices shall mount to a standard single gang electrical box and have an optional trim ring for 2-gang, octagonal or 4" (102mm) square boxes.

.8 The signalling device series shall share a common appearance and be available in a horn, strobe or combination horn/strobe unit as listed on the plans.

.3 Sounder Base

.1 Signature series SIGA-AB4G audible base.

.2 Operating voltage: 16-33Vdc.

2.18 CONDUIT

.1 Electrical Metallic Tubing (EMT):

.1 19 mm min. size.

.2 Use in all corridors and runs between floors.

.3 Red markings every 15m for identification of fire alarm conduit.

.4 Concealed in ceiling spaces

.5 Surface mounted conduit drops to devices permitted.

.1 Surface mounted conduit to be painted to match aesthetics.

2.19 WIRING

.1 Twisted copper conductors: rated 120V.

.2 To initiating circuits: 16 AWG minimum, ULC listed and in accordance with manufacturer's requirements.

.3 To signal circuits: 16 AWG minimum, ULC listed and in accordance with manufacturer's requirements.

.4 To control circuits: 14 AWG minimum, ULC listed and in accordance with manufacturer's requirements.

.5 Optical-fiber cable: 62.5/125 multi-mode.

2.20 REMOTE PRINTER

.1 System printer: to give a hard copy record of system events c/w following features:

The event and status printer shall be a 9-pin, impact, dot matrix printer with a minimum print speed of 232 characters per second. The printer shall be capable of serial or parallel communications protocol. The communications speed for RS-232 communications protocol shall be adjustable from 300 to 9600 Baud. The printer shall list the time, date, type and user defined message for each event printed.

2.21 REMOTE TERMINAL

.1 CRT screen: 120 V, 60 Hz, to incorporate 100% solid state circuitry, with 30 cm screen and front mounted controls for brightness, contrast, vertical and horizontal hold and power ON/OFF switch.

2.22 AS-BUILT RISER DIAGRAM

.1 Fire alarm system riser diagram: in glazed frame, minimum size 600 x 600 mm.

2.23 ANCILLARY DEVICES

.1 Remote relay unit to initiate fan shutdown.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for fire alarm installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative.

.2 Inform the Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Departmental Representative.

3.2 INSTALLATION

.1 Install systems in accordance with CAN/ULC-S524, TB Fire Protection Standard, and approved manufacturer’s manuals/wiring diagrams.

.2 The contractor shall furnish all labour, conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for a complete, functional life safety fire alarm system.

.3 Provide all necessary power supply, interconnecting and remote signal wire in dedicated conduit throughout and installed in accordance with the manufacturer's wiring diagrams and the requirements of the Canadian Electrical Code and the Inspection Authority.

.4 All penetration of floor slabs and fire walls shall be fire stopped in accordance with all local fire codes. End-of-line resistors shall be furnished as required for mounting as directed by the manufacturer.

.5 Install central control unit and connect to ac power supply, dc standby power.

.6 Install manual alarm stations and connect to alarm circuit wiring.

.7 Locate and install detectors and connect to alarm circuit wiring. Mount detectors more than 1 m from air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.

.8 Connect alarm circuits to main control panel.

.9 Install horns and visual signal devices, bells, signal and connect to signalling circuits.

.10 Connect signalling circuits to main control panel.

.11 Install end-of-line devices at end of alarm and signalling circuits.

.12 Install remote annunciator panels and connect to annunciator circuit wiring.

.13 Install door releasing devices.

.14 Install remote relay units to control fan shut down.

.15 Sprinkler system: wire alarm and supervisory switches and connect to control panel.

.16 Connect fire suppression systems to control panel.

.17 Splices are not permitted.

.18 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.

.19 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.

.20 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

3.3 CABLE AND RACEWAY INSTALLATION

.1 Installation shall be in accordance with CAN/ULC-S524 and the Canadian Electrical Code as shown on the drawings, and as required by the equipment manufacturer.

.2 All raceway, junction boxes, raceway supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.

.3 Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

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

.5 Manual Stations shall be suitable for surface mounting or semi flush mounting as shown on the plans, and shall be installed not less than 1050 mm, nor more than 1150 mm above the finished floor.

.6 Raceway shall be in accordance with the Canadian Electrical Code (CEC), and all provincial and local Electrical Authority requirements.

.7 Where possible, all wiring shall be installed in raceways. Raceway fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single raceway.

.8 Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any junction box or raceway containing these conductors.

.9 Wiring for 24 V control, alarm signalling, emergency communication and similar power-limited auxiliary functions may be run in the same raceway as initiating and signaling line circuits-as approved and permitted by the manufacturer.

.10 All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals

.11 Raceway shall not enter the fire alarm system, or any other remotely mounted system equipment or back boxes, except where raceway entry is specified by the manufacturer

.12 All fire alarm system wiring must copper and be new.

.13 Wiring shall be in accordance with local, provincial and national codes and as recommended by the manufacturer of the fire alarm system.

.14 The number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for initiating device circuits and signalling line circuits, and 12 AWG (1.63 mm) for alarm signalling circuits

.15 All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signalling system.

.16 Wire and cable not installed in raceways shall have a fire resistance rating suitable for the installation as indicated.

.17 The system shall permit the use of initiating and signalling circuit wiring in the same raceway with the multiplex communication link and shall be suitable for use with fiber optic cabling.

.18 All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.

3.4 TERMINAL BOXES, JUNCTION BOXES AND CABINETS

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

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

.3 The fire alarm control units shall be connected to a separate dedicated branch circuit, maximum 15 amperes.

.4 This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm system primary power wiring shall be 12 AWG.

3.5 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 and CAN/ULC-S537.

.2 The system shall be installed and fully tested under the supervision of a trained manufacturer’s representative. The system shall be demonstrated to perform all of the function as specified.

.3 The Installing Contractor and the Fire Alarm System Vendor shall, upon the request of the Departmental Representative or End-User, attend any and all project meetings for the purpose of accurately determining progress.

.4 It shall be the responsibility of the installing contractor to assure that construction debris does not adversely affect any sensing devices installed as part of this project. Should it be deemed necessary by the Departmental Representative, End-User or AHJ, the installing contractor shall be responsible for the cleaning of all smoke detectors prior to final acceptance.

.5 Fire alarm system:

.1 Test such device and alarm circuit to ensure manual stations, detectors, thermal and smoke detectors transmit alarm to control panel and actuate first stage alarm.

.2 Check annunciator panels to ensure zones are shown correctly.

.3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of systems.

.4 Tests to be carried out by manufacturer’s representative.

.5 Tests to include witness of fan shutdown, magnetic door holder operation, preaction/clean agent system operation and all other ancillary devices.

.6 Tabulated, contractor stamped, signed and dated test results are to be submitted to the Departmental Representative for review and approval, and included in the O&M manual.

.7 Addressable circuits system style DCLA:

.1 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals on each side of single open-circuit fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.

.2 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.

.6 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for recycling, reuse in accordance with Section 01 74 20.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.2 Place materials defined as hazardous or toxic waste in designated containers.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by fire alarm system installation.

3.8 CLOSEOUT ACTIVITIES

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

.2 Allow for three (3) separate training sessions, three (3) hours for each.

END OF SECTION