



Public Services and  
Procurement Canada

Services publics et  
Approvisionnement Canada

CONSTRUCTION SPECIFICATIONS  
ISSUED FOR TENDER  
FOR  
CORRECTIONAL SERVICE CANADA  
EDMONTON INSTITUTION GUN PORT  
REPLACEMENT, RETROFIT AND  
MODERNIZATION  
EDMONTON INSTITUTION, AB

21611 MERIDIAN STREET,  
EDMONTON, AB, T5Y 6E7

PROJECT NUMBER  
R.091022.001

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**END OF SECTION**



**Part 1 General**

**1.1 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises replacement of gun ports, renovation of look-out cages, and hazardous materials abatement, at Edmonton Institution, 21611 Meridian Street, Edmonton, Alberta.
- .2 This project encompasses four separate CSC projects, and are expressed in the drawings as follows:
  - .1 CSC Project # 539-3605 – Unit #6 Seven Large Rectangular Gun Ports
  - .2 CSC Project # 539-2704 – 4 Round Gun Ports in Glazing
  - .3 CSC Project # 539-2702 – 14 Small Rectangle Gun Ports
  - .4 CSC Project # 539-2703 – Catwalk Grilles
  - .5 Provide the following:
    - .1 Breakdown against each of the four CSC projects with their firm price bid.
    - .2 Breakdown of amount attributable to each of the four projects for each progress payment submitted.

**1.2 CONTRACT METHOD**

- .1 Construct Work under single stipulated price contract.

**1.3 WORK BY OTHERS**

- .1 HVAC work by other Contractors will be performed in the area of Project #539-3605 - Unit #6.
- .2 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Departmental Representative.
- .3 Co-ordinate Work with that being performed by 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 Departmental Representative, in writing, defects which may interfere with proper execution of Work.

**1.4 WORK SEQUENCE**

- .1 Construct Work in stages to accommodate continued use of premises during construction.
- .2 Sequence Work so that selective demolition and construction of Project #539-3605 - Unit #6 is performed to substantial completion first, before beginning other phases of Work.
- .3 Co-ordinate Progress Schedule and co-ordinate with occupancy during construction.
- .4 Maintain fire access/control.

**1.5 CONTRACTOR USE OF PREMISES**

- .1 Execute work with least possible interference and disturbance to building operations, occupants, and normal use of premises.
- .2 Refer to Section 01 14 10 – Security Requirements.
- .3 Co-ordinate use of premises under direction of Departmental Representative.\
- .4 Contractor will be provided a lay-down area to be used for storage of tools and materials.
- .5 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .6 Remove or alter existing work to prevent injury or damage to portions of existing work that remain.
- .7 Repair or replace portions of existing work that have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
- .8 Condition of work at completion of operations: equal to or better than that which existed before new work started.

**1.6 EXISTING SERVICES**

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 7 days' notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to building operations.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .4 Submit schedule to and obtain approval from Departmental Representative for shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .5 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .7 Record locations of maintained, re-routed and abandoned service lines.

**1.7 DOCUMENTS REQUIRED**

- .1 Successful bidding Contractor is to obtain required sets of Contract Documents for construction purposes, which includes two (2) sets for "as-built" and record purposes.

- .1 Contractor is responsible for costs of printing, handling, and shipping of Contract Documents.
- .2 Maintain at job site, one copy each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 List of Outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Other Modifications to Contract.
  - .8 Field Test Report, Commissioning Verification Testing, and Verification Documentation such as Forms, Check sheets, and Commissioning Issues/Resolution Log.
  - .9 Copy of Approved Work Schedule.
  - .10 Health and Safety Plan and Other Safety Related Documents.
  - .11 Other documents as specified.

**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, ladders, and scaffolding, 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 Departmental Representative to facilitate work as stated.
- .2      Maintain existing services to building and provide for personnel and vehicle access.
- .3      CSC Site Representative or CSC Construction Liaison officer will assign sanitary facilities for use by Contractor's personnel. Keep sanitary facilities clean.
- .4      Closures: Protect work temporarily until permanent enclosures are completed.
- .5      Contractor will be allowed to use on-site potable water and electrical power facilities while working within the Institution. Coordinate with Departmental Representative and EMSI personnel for usage.

**1.3            SPECIAL REQUIREMENTS**

- .1      Submit schedule in accordance with Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart.
- .2      Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic, and security regulations.
- .3      Keep within limits of work and avenues of ingress and egress.
- .4      Ingress and egress of Contractor vehicles at site is limited to Main Entrance at Edmonton Institution.

**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 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,
  - .3 an explosive or a bomb or a component thereof,
  - .4 currency over any applicable prescribed limit, \$25.00, and
  - .5 any item not described in paragraphs (a) to (d) 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 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.
- .6 "Construction employees" means persons working for the general contractor, the subcontractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.
- .7 "Departmental Representative" means the Public Works and Government Services Canada representative defined in General Conditions.
- .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 indicated in the contract documents, that the contractor will be allowed to work. This area may or may not be isolated from the security area of the institution. Limits to be confirmed at construction start-up meeting.

### **1.3 PRELIMINARY PROCEEDINGS**

- .1 At construction start-up meeting:
  - .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 specific requirements.
- .2 Contractors' responsibilities:
  - .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 All construction employees will be escorted on the site.
- .2 Submit to the Departmental Representative a list of names, with dates of birth, of construction employees to be employed on the construction site, and security clearance form for each employee.
- .3 Allow 10 working days for processing of security clearances. Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC institutions are not valid at this institution except as approved otherwise.
- .4 The Director may require that facial photographs of construction employees be taken, and these photographs may be displayed at appropriate locations in the institution or in an electronic database for identification purposes. The Director may require that these Photo ID cards be provided for all construction workers. ID cards are to be left at the designated entrance and picked up upon arrival at the Institution. Construction employees are to prominently display ID cards on clothing at all times while in the institution.
- .5 Entry to Institutional Property will be refused to any person there may be reason to believe poses a security risk.
- .6 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.

### **1.5 VEHICLES**

- .1 Unattended vehicles on CSC property must have windows closed; fuel caps locked, doors and trunks locked, and keys removed. The keys must be securely

in the possession of the vehicle's 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 require security clearances and 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 PWGSC Construction Escorts while in the Institution.
- .4 If the Director permits trailers to be left inside the secure perimeter of the Institution, the trailer doors must always be locked. All windows must be securely locked with bars when left unoccupied. Cover all windows with expanded metal mesh. When not in use, lock storage trailers located inside and outside the perimeter.

## **1.6 PARKING**

- .1 Parking areas 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 To avoid confusion with the Institution's own shipments, address shipments of project material, equipment, and tools in Contractor's name and have a representative on site to receive deliveries or shipments. CSC or PWGSC staff will not accept receipt of deliveries or shipments of material, equipment, and tools.

## **1.8 TELEPHONES**

- .1 Installation of telephones, facsimile machines, and computers with Internet connections is not permitted within the Institution perimeter without prior approval by the Director.
- .2 The Director will ensure that approved telephones, facsimile machines, and computers with Internet connections are located where they are not accessible to inmates. All computers are to have 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 and telephones 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 2-way radios.

## **1.9 WORK HOURS**

- .1 Normal hours of work: 2200 h to 0700 h (10:00 pm to 7:00 am). Where possible, work is to be scheduled within these hours.

- .2 Work is not 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.

- .3 Work hours – allowed and preferred:

| Project Work Area                    | Allowable times   | Notes  |
|--------------------------------------|---|--|
| Unit 6 – Area A                      | 22:00 h to 06:00 h (10:00 pm to 6:00 am).<br>If the work can be completed in conjunction with the HVAC project, while inmates are relocated, then same hours as below are requested.  | All work areas must be made secure and all tools and equipment removed from the area prior to ending shift |
| Catwalk above and in Gym N – Area B  | Monday to Friday, 07:00 h to 17:00 h (7:00 am to 5:00 pm)   | All work areas must be made secure and all tools and equipment removed from the area prior to ending shift |
| Catwalk above and in Gym N – Area B  | If work must be completed over the weekend due to project deadlines:<br>Weekends: 22:30 h to 07:30 h (10:30 pm to 7:30 am)  | All work areas must be made secure and all tools and equipment removed from the area prior to ending shift |
| Catwalk above and in Corcan – Area C | Gun ports overlooking Corcan area may be worked on 24 hours a day as there are no inmates in area. Gun ports overlooking Kitchen cart room, and two programs areas are used intermittently during dayshift, 0700 h – 1600 h (7:00 am to 4:00 pm), and can be made available with adequate notice given to be able to work in these areas during the day, 7 days a week, as the kitchen has inmates employed every day.<br>Preference would be day work, Monday thru Friday, and coordination to not have inmates working in area during hours of work chosen. | All work areas must be made secure and all tools and equipment removed from the area prior to ending shift |

#### 1.10 OVERTIME WORK

- .1 Provide 48 hours' advance notice to Director for work to be performed after normal working hours of the Institution. Notify Director immediately if emergency work is required, such as to complete a concrete pour or make the construction site safe and secure.

#### 1.11 TOOLS AND EQUIPMENT

- .1 Maintain a complete list of tools and equipment to be used during the construction project. Make inventory available for inspection when required by the Institution.
- .2 Throughout the construction project, maintain the list of tools and equipment and keep it up-to-date.
- .3 Keep tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders, and jacking devices.



- .4 Store tools and equipment in approved secure locations.
- .5 Lock tool boxes when not in use. Keys to remain in possession of employees of Contractor. Secure and lock scaffolding. Secure in a manner agreed upon with the Institution Director.
- .6 Report all missing or lost tools or equipment immediately to Departmental Representative/Director.
- .7 The Director will ensure that security staff members carry out checks of 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 work day or shift upon entering and exiting the Institution.
  - .2 At any time when contractor is on Institution property.
- .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 are to be returned to the Director's representative at the end of each day. Maintain up to date inventory of used blades/cartridges.
- .9 If propane or natural gas is used for heating the construction, the Institution will require that the contractor supervise the construction site during non-working hours.

## **1.12 KEYS**

- .1 Security Hardware Keys.
  - .1 Arrange with the security hardware supplier/installer to have keys for security hardware to be delivered directly to Institution, to Security Maintenance Officer (SMO).
  - .2 SMO will provide a receipt to the Contractor for security hardware keys.
  - .3 Provide a copy of the receipt to the Departmental Representative.
- .2 Other Keys:
  - .1 Use standard construction cylinders for locks for use during the construction period.
  - .2 Issue instructions to employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.
- .3 Upon completion of each phase of construction, the CSC Representative will, in conjunction with the lock manufacturer:
  - .1 Prepare an operational keying schedule.
  - .2 Accept operational keys and cylinders directly from lock manufacturer.
  - .3 Arrange for removal and return of construction cores and install operational cores in all locks.
- .4 Upon putting operational security keys into use, the PWGSC construction escort is to obtain these keys as they are required from the SMO and open doors as

required by the Contractor. The Contractor shall issue instructions to his employees advising them that all security keys shall always remain with the PWGSC 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 Smoking is not permitted inside correctional facilities or outdoors within the perimeter of a correctional facility. Personnel must not possess unauthorized smoking items within the perimeter of a correctional facility.
- .2 Persons in violation of this policy will be requested to immediately cease smoking or dispose of unauthorized smoking items and, if they persist, will be directed to leave the Institution.
- .3 Smoking is permitted outside the perimeter of a correctional facility in area designated by the Director.

**1.16 CONTRABAND**

- .1 Weapons, ammunition, explosives, alcoholic beverages, drugs, and narcotics are prohibited on institutional property.
- .2 The discovery of contraband on the construction site and the identification of the personnel responsible for the contraband shall be reported immediately to the Director.
- .3 Contractors are to be vigilant with their staff, sub-contractors, and suppliers that the discovery of contraband may result in cancellation of 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, suppliers, or their employees will result in immediate cancellation of security clearances for the driver of the vehicle.

**1.17 SEARCHES**

- .1 All vehicles and persons entering institutional property are subject to search.
- .2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of contraband, the Director may order that person to be searched.

- .3 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 INSTITUTIONAL 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 Escorted commercial vehicles may not be allowed to enter or leave the institution through the vehicle access gate during the regular "inmate count" occurring at breakfast, lunch, and dinner times as established by the Institution. Confirm "count" times with Director or Departmental Representative to reduce down times for deliveries to Institution and movement of contractors' vehicles through Institution vehicle access gate.
- .2 Construction vehicles are not allowed to leave the Institution until inmate count is completed.
- .3 Advise the Director twenty-four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks and cranes.
- .4 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be continuously supervised by CSC staff or PWGSC construction escorts working under the authority of the Director.
- .5 Commercial vehicles will only be allowed access to institutional property when their contents are certified by the Contractor or representative as being strictly necessary to the execution of the construction project.
- .6 Vehicles shall be refused access to institutional property if, in the opinion of the Director, they contain any article that may jeopardize the security of the institution. Arrange with Director for parking of contractor's vehicles at minimum security Institutions.
- .7 Private vehicles of construction employees are not allowed within the security wall or fence of medium security or maximum security institutions without the permission of the Director.
- .8 With prior approval of the Director, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the Institution the remainder of the day.
- .9 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 security, the Director will permit the Contractor and employees as much freedom of action and movement as is possible.
- .2 Notwithstanding the 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 are 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 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, 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 is to 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 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 speak 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 their 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.

**END OF SECTION**

**Part 1 General**

**1.1 ADMINISTRATIVE**

- .1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 Reproduce and distribute copies of minutes within three days after meetings; transmit to Departmental Representative, meeting participants, and affected parties not in attendance.
- .8 Representatives of Contractor, Subcontractor, and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.2 PRECONSTRUCTION MEETING**

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Prime Consultant, Contractor, major Subcontractors, field inspectors, and supervisors are to attend.
- .3 Establish time and location of meeting and notify parties concerned minimum five days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Schedule of Work: in accordance with Section 01 32 16.19 - Construction Progress Schedules - Bar (GANTT) Chart.
  - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .4 Requirements for temporary facilities in accordance with Section 01 52 00 - Construction Facilities.
  - .5 Site security in accordance with Section 01 14 10 – Security Requirements.
  - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

- .7 Departmental Representative-provided products.
- .8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

### **1.3 PROGRESS MEETINGS**

- .1 During course of Work and two weeks prior to project completion, schedule progress meetings bi-weekly.
- .2 Prime Consultant, Contractor, major Subcontractors involved in Work, and Departmental Representative are to attend.
- .3 Notify parties minimum three days prior to meetings.
- .4 Record minutes of meetings; circulate to attending parties and affected parties not in attendance within three days after meeting.
- .5 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems that impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules and expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for effect on construction schedule and on completion date.
  - .12 Other business.

**END OF SECTION**

**Part 1            General**

**1.1            DEFINITIONS**

- .1      Activity: Element of Work performed during course of Project. Activity normally has expected duration, expected cost, and expected resource requirements. Activities can be subdivided into tasks.
- .2      Bar Chart (GANTT Chart): Graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Chart should be derived from commercially available computerized project management system.
- .3      Baseline: Original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4      Construction Work Week: Monday to Friday, inclusive, will provide five-day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5      Duration: Number of work periods (not including holidays or other nonworking periods) required to complete activity or project element. Usually expressed as workdays or workweeks.
- .6      Master Plan: Summary-level schedule that identifies major activities and key milestones.
- .7      Milestone: Significant event in project, usually completion of major deliverable.
- .8      Project Schedule: Planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision-making throughout project life cycle.
- .9      Project Planning, Monitoring and Control System: Overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

**1.2            REQUIREMENTS**

- .1      Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2      Plan to complete Work in accordance with prescribed milestones and time frame.
- .3      Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4      Ensure it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

### **1.3 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative, within 10 working days of Award of Contract, Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

### **1.4 MASTER PLAN**

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and re-submit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

### **1.5 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Shop Drawings, Samples.
  - .3 Permits.
  - .4 Mobilization.
  - .5 Mock-Ups.
  - .6 Interior Architecture.
  - .7 Electrical.
  - .8 Testing and Commissioning.

### **1.6 PROJECT SCHEDULE REPORTING**

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

### **1.7 PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings. Identify activities that are behind schedule and provide measures to regain slippage. Activities considered



behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

- .2 Weather related delays and remedial measures will be discussed and negotiated.

**END OF SECTION**

**Part 1            General**

**1.1            ADMINISTRATIVE**

- .1 Provide submittals listed for review to Departmental Representative. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension for such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples, and mock-ups in SI Metric units.
- .4 Where items or information are not produced in SI Metric units, converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated, and identified as to specific project will be returned without being examined, and considered rejected.
- .6 Notify Departmental Representative at time of submission, in writing, identifying deviations from requirements of Contract Documents, stating reasons for deviations.
- .7 Allow 10 working days for Departmental Representative's review of each submission.
- .8 Verify field measurements and affected adjacent Work are co-ordinated.
- .9 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .10 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .11 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 that are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Where required, submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross-references to design drawings and specifications.

- .4 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.
- .5 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .6 Accompany submissions with transmittal letter, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .7 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
- .8 After Departmental Representative's review, distribute copies.
- .9 Submit electronic copy of shop drawings for each requirement requested in specification Sections, and as Departmental Representative may reasonably request.
- .10 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental

- Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .11 Submit electronic copies of test reports for requirements requested in specification Sections, and as requested by Departmental Representative.
    - .1 Report signed by authorized official of testing laboratory, indicating 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 performed within 3 years of date of contract award for project.
  - .12 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
    - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
    - .2 Certificates must be dated after award of project contract complete with project name.
  - .13 Submit electronic copies of manufacturers' instructions for requirements requested in specification Sections and as requested by Departmental Representative.
    - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards, and safety precautions.
  - .14 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative:
    - .1 Documentation of testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
  - .15 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
  - .16 Delete information not applicable to project.
  - .17 Supplement standard information to provide details applicable to project.
  - .18 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.
  - .19 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining general conformance with design intent.

- .1 This review shall not mean that PWGSC 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 requirements of construction and Contract Documents.
- .2 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 sub-trades.

### **1.3 SAMPLES**

- .1 Submit samples for review in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address.
- .3 Notify Departmental Representative in writing, at time of submission, of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern, or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state so in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples that Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of quality of work and material against which installed Work will be verified.

### **1.4 MOCK-UPS**

- .1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

### **1.5 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution, as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints:
  - .1 As required to reveal:
    - .1 Work performed to date.
    - .2 Context of situation under discussion.
- .4 Frequency of photographic documentation: Bi-weekly.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Province of Alberta
  - .1 Occupational Health and Safety Act, SA 2017, Chapter O-2.1 - Updated 2018.
- .2 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

**1.2 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation.
- .3 Submit 1 copy of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS Safety Data Sheets (SDS) for products used in the project.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 3 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 3 days after receipt of comments from Departmental Representative.
- .8 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.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.
  - .1 Consult with Departmental Representative for site-specific protocols to be followed in case of emergencies.

**1.3 FILING OF NOTICE**

- .1 Where required, file Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

**1.4 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

**1.5 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

**1.6 REGULATORY REQUIREMENTS**

- .1 Perform Work in accordance with Section 01 41 00 - Regulatory Requirements.

**1.7 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

**1.8 RESPONSIBILITY**

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

**1.9 COMPLIANCE REQUIREMENTS**

- .1 Comply with Province of Alberta Occupational Health and Safety Act and its regulations.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

**1.10 UNFORESEEN HAZARDS**

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

**1.11 WHMIS**

- .1 Ensure that products used in project comply with Workplace Hazardous Materials Information System (WHMIS) Regulations and Chemical Substances of the OH&S Act and Regulations regarding use, handling, labelling, storage, and disposal of hazardous materials.
- .2 Deliver copies of relevant Material Safety Data Sheets (MSDS) to job site and Departmental Representative. MSDS to be acceptable to Labour Canada and Health and Welfare Canada for controlled products that will be used in performance of this work. Locate MSDS in accessible locations for workers and visitors throughout the site, bound and organized in binders.
- .3 Train workers required to use or to work in close proximity to controlled products in accordance with OH&S Act and Regulations.
- .4 Label controlled products at jobsite in accordance with OH&S and Regulations and WHMIS.
- .5 Provide appropriate emergency facilities as specified in the MSDS where workers might be exposed to contact with chemicals, including eye-wash facilities, emergency shower.
  - .1 Workers are to be trained in use of such emergency equipment.
- .6 Provide appropriate personal protective equipment as specified in the MSDS where workers are required to use controlled products.
  - .1 Properly fit workers for personal protective equipment
  - .2 Train workers in care, use, and maintenance of personal protective equipment.
- .7 No controlled products are to be brought on-site without prior approved MSDS.
- .8 MSDS are to remain on site at all times.

**1.12 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

**1.13 CORRECTION OF NON-COMPLIANCE**

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

**1.14 BLASTING**

- .1 Blasting or other use of explosives is not permitted.



**1.15 POWDER ACTUATED DEVICES**

- .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

**1.16 WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES AND CODES**

- .1 Perform Work in accordance with 2015 National Building Code of Canada (NBC) including amendments up to tender closing date, and other codes of provincial or local application; in case of conflict or discrepancy, more stringent requirements apply. The following governing standards are also to apply.
  - .1 Canadian Electrical Code, 2015.
  - .2 National Plumbing Code of Canada, 2015.
  - .3 National Fire Code of Canada, 2015.
- .2 Meet or exceed requirements of:
  - .1 Contract documents.
  - .2 Specified standards, codes, and referenced documents.

**1.2 PERMITS**

- .1 Except as otherwise specified, apply for, obtain, and pay fees associated with permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:
  - .1 Regulatory requirements and fees in force on date of Bid submission, and
  - .2 Changes in regulatory requirements or fees schedules to become effective after date of tender submission and of which public notice has been given before date of tender submission.

**1.3 HAZARDOUS MATERIAL DISCOVERY**

- .1 Asbestos: Demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.
- .2 PCB: Polychlorinated Biphenyl: Stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.
- .3 Mould: Stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

**1.4 BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions and municipal by-laws.

**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 wherever it is in progress.
- .2    Give timely notice requesting inspection if Work is designated for special tests, inspections, or approvals whether by Departmental Representative instructions, or by 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 Contract Documents. If, upon examination, such work is found not in accordance with Contract Documents, correct Work and pay cost of examination and correction. If Work is found in accordance with Contract Documents, cost of examination and replacement will be borne by Departmental Representative.

**1.2            INDEPENDENT INSPECTION AGENCIES**

- .1    Independent Inspection/Testing Agencies may be engaged by Departmental Representative for purpose of inspecting and testing portions of Work. Cost of such services will be borne by 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 testing, appointed agency will request additional inspection and testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting 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 Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

- .2 Submit samples 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 Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If, in opinion of Departmental Representative, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

#### **1.6 REPORTS**

- .1 Submit three hard copies and one electronic copy of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested.

#### **1.7 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

#### **1.8 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 Departmental Representative.
- .3 Prepare mock-ups for 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 If requested, Departmental Representative will assist in preparing schedule-fixing dates for preparation.
- .6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

**1.9 MILL TESTS**

- .1 Submit mill test certificates as requested.

**1.10 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

**END OF SECTION**

**Part 1 General**

**1.1 SUBMITTALS**

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

**1.2 INSTALLATION AND REMOVAL**

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

**1.3 WATER SUPPLY**

- .1 Departmental Representative will provide continuous supply of potable water for construction use.

**1.4 TEMPORARY POWER AND LIGHT**

- .1 Coordinate with Departmental Representative for temporary power during construction for operating power tools.
- .2 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .3 Existing electrical power and lighting systems and those installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative, provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps that have been used for more than 3 months.

**1.5 FIRE PROTECTION**

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

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA S269.2-M87 (R2003), Access Scaffolding for Construction Purposes.
  - .2 CAN/CSA Z321-96 (R2006), Signs and Symbols for the Workplace.

**1.2 SUBMITTALS**

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

**1.3 INSTALLATION AND REMOVAL**

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas that have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

**1.4 SCAFFOLDING**

- .1 Scaffolding in accordance with CSA S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, temporary stairs.

**1.5 ELEVATORS**

- .1 Existing elevators are not to be used by construction personnel.
- .2 Provide protective coverings for finish surfaces of cars and entrances.

**1.6 SITE STORAGE/LOADING**

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

**1.7 EQUIPMENT, TOOL, AND MATERIALS STORAGE**

- .1 Provide a secured weatherproof container for storage, to be located in lay-down area assigned by Departmental Representative.
  - .1 At end of each workday, transfer all tools and materials from work area to secured container.

**1.8 CONSTRUCTION PARKING**

- .1 Refer to Section 01 14 10 – Security Requirements.

**1.9 CONSTRUCTION SIGNAGE**

- .1 Signs and notices for safety and instruction in both official languages; graphic symbols to CAN/CSA Z321.
- .2 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

**1.10 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

**END OF SECTION**



**Part 1        General**

**1.1            INSTALLATION AND REMOVAL**

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

**1.2            GUARD RAILS AND BARRICADES**

- .1      Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors, and other potential falling hazards.
- .2      Provide as required by governing authorities.

**1.3            DUST TIGHT SCREENS**

- .1      Provide dust tight screens or partitions to localize dust-generating activities, and for protection of workers, finished areas of Work, and occupants.
- .2      Maintain and relocate protection until such work is complete.
- .3      Coordinate location and security measures with Departmental Representative on Site.

**1.4            FIRE ROUTES**

- .1      Maintain access to property including overhead clearances for use by emergency response vehicles.

**1.5            PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

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

**1.6            PROTECTION OF BUILDING FINISHES**

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

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .2 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .3 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

**1.2 QUALITY OF PRODUCTS**

- .1 Products, materials, equipment, and articles incorporated in Work are to be new, not damaged nor 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 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 Price 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 cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over nameplates.

#### **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 Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes 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 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. 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 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 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. Perform in a manner to neither damage nor put at risk any portion of Work.
- .2 For remedial work, employ specialists familiar with materials affected.

#### **1.11 LOCATION OF FIXTURES**

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform 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 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood or other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly, and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

**1.13 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. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

**1.14 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 Departmental Representative.

**END OF SECTION**

**Part 1        General**

**1.1            LOCATION OF EQUIPMENT AND FIXTURES**

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

**END OF SECTION**

**Part 1        General**

**1.1        SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Submit written request in advance of cutting or alteration which affects:
  - .1        Structural integrity of elements of project.
  - .2        Integrity of weather-exposed or moisture-resistant elements.
  - .3        Efficiency, maintenance, or safety of operational elements.
  - .4        Visual qualities of sight-exposed elements.
  - .5        Work of separate contractor.
- .3        Include in request:
  - .1        Identification of project.
  - .2        Location and description of affected Work.
  - .3        Statement on necessity for cutting or alteration.
  - .4        Description of proposed Work, and products to be used.
  - .5        Alternatives to cutting and patching.
  - .6        Effect on Work of separate contractor.
  - .7        Written permission of affected separate contractor.
  - .8        Date and time work will be executed.

**1.2        PREPARATION**

- .1        Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2        After uncovering, inspect conditions affecting performance of Work.
- .3        Beginning of cutting or patching means acceptance of existing conditions.
- .4        Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5        Provide protection from elements for areas that are to be exposed by uncovering work; maintain excavations free of water.

**1.3        EXECUTION**

- .1        Execute cutting, fitting, and patching to complete Work.
- .2        Fit parts together, to integrate with other Work.
- .3        Uncover Work to install ill-timed Work.
- .4        Remove and replace defective and non-conforming Work.
- .5        Execute Work by methods to avoid damage to other Work, and that will provide proper surfaces to receive patching and finishing.

- .6 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .7 Restore work with new products in accordance with requirements of Contract Documents.
- .8 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .9 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

**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 other Contractors.
- .2        Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3        Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4        Provide on-site containers for collection of waste materials and debris. Equip containers with covers to prevent spread of waste by wind, and entry into container by unauthorized persons.
- .5        Dispose of waste materials and debris off site.
- .6        Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .7        Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8        Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9        Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10       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 other Contractors.
- .5        Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6        Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

- .7 Clean and polish glass, hardware, 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 Vacuum clean and dust building interiors, behind grilles, and screens.
- .10 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .11 Remove dirt and other disfiguration from exterior surfaces.
- .12 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

**END OF SECTION**

**Part 1 General**

**1.1 DEFINITIONS**

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re-modeling, repair and demolition operations.
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
- .4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non-toxic: Not poisonous to humans either immediately or after a long period of exposure.
- .6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- .7 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- .8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Return: To give back reusable items or unused products to vendors for credit.
- .10 Reuse: To reuse a construction waste material in some manner on the project site.
- .11 Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- .12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.
- .13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- .14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- .16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:
  - .1 Solvents in paints and other coatings;
  - .2 Wood preservatives; strippers and household cleaners;

- .3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.
- .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.
- .18 Construction Waste Management Plan: A project related plan for the collection, transportation, and disposal of the waste generated at the construction site; the purpose of the plan is to ultimately reduce the amount of material being landfilled.

## **1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project, and ensure that requirements of the Construction Waste Management Plan are followed.
- .2 Preconstruction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings before starting any Work of the Contract attended by the Contractor, affected Subcontractors and Departmental Representative to discuss the Construction Waste Management Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

## **1.3 SUBMITTALS**

- .1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Draft Construction Waste Management Plan (Draft CWM Plan): Submit to Departmental Representative a preliminary analysis of anticipated site generated waste by listing a minimum of five (5) construction or demolition waste streams that have potential to generate the most volume of material indicating methods that will be used to divert construction waste from landfill and source reduction strategies; Departmental Representative will provide commentary before development of Contractor's Construction Waste Management Plan.
  - .2 Construction Waste Management Plan (CWM Plan): Submit a CWM Plan for this project prior to any waste removal from site and that includes the following information:
    - .1 Material Streams: Analysis of the proposed jobsite waste being generated, including material types and quantities forming a part of identified material streams in the Draft CWM Plan; materials removed from site destined for alternative daily cover at landfill sites and land clearing debris cannot be considered as

contributing to waste diversion and will be included as a component of the total waste generated for the site.

- .2 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.
- .3 Alternative Waste Disposal: Prepare a listing of each material proposed to be salvaged, reused, recycled or composted during the course of the project, and the proposed local market for each material.
- .4 Landfill Materials: Identify materials that cannot be recycled, reused or composted and provide explanation or justification; energy will be considered as a viable alternative diversion strategy for these materials where facilities exist.
- .5 Landfill Options: The name of the landfill where trash will be disposed of; landfill materials will form a part of the total waste generated by the project.
- .6 Materials Handling Procedures: A description of the means by which any recycled waste materials will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
- .7 Transportation: A description of the means of transportation of the recyclable materials, whether materials will be site separated and self hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site, and destination of materials.

#### **1.4 PROJECT CLOSEOUT SUBMISSIONS**

- .1 Record Documentation: Submit as constructed information in accordance with Section 01 78 00 – Closeout Submittals as follows:
  - .1 Construction Waste Management Report (CWM Report): Submit a CWM Report for this project in a format acceptable to submittal requirements and that includes the following information:
    - .1 Accounting: Submit information indicating total waste produced by the project.
    - .2 Composition: Submit information indicating types of waste material and quantity of each material.
    - .3 Diversion Rate: Submit information indicating total waste diverted from landfill as a percentage of the total waste produced by the project.
    - .4 Transportation Documentation: Submit copies of transportation documents or shipping manifests indicating weights of materials, and other evidence of disposal indicating final location of waste diverted from landfill and waste sent to landfill.

- .5 Multiple Waste Hauling: Compile all information into a single CWM Report where multiple waste hauling and diversion strategies were used for the project.

## **1.5 QUALITY ASSURANCE**

- .1 Resources for Development of Construction Waste Management Report (CWM Report): The following sources may be useful in developing the Draft Construction Waste Management Plan:
  - .1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the project waste and the available recycling and reuse programs in the project area.
- .2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:
  - .1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
  - .2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.
- .3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

## **Part 2 Products**

Not used.

## **Part 3 Execution**

### **3.1 CWM PLAN IMPLEMENTATION**

- .1 Manager: Contractor is responsible for designating an on-site party or parties responsible for instructing workers and overseeing and documenting results of the CWM Plan for the project.
- .2 Distribution: Distribute copies of the CWM Plan to the job site foreman, each Subcontractor, the Departmental Representative and other site personnel as required to maintain CWM Plan.
- .3 Project Documentation: Submit a summary of waste generated by the project to ensure that waste diversion goals are on track with project requirements:

- .1 Submission of waste summary can coincide with application for progress payment, or similar milestone event as agreed upon between the Contractor and Departmental Representative.
- .2 Waste summary shall contain the following information:
  - .1 The amount in tonnes or m<sup>3</sup> and location of material landfilled,
  - .2 The amount in tonnes or m<sup>3</sup> and location of materials diverted from landfill.

### **3.2 SUBCONTRACTOR'S RESPONSIBILITY**

- .1 Subcontractors shall cooperate fully with the Contractor to implement the CWM Plan.

**END OF SECTION**

**Part 1 General**

**1.1 ADMINISTRATIVE REQUIREMENTS**

- .1 Acceptance of Work Procedures:
  - .1 Contractor's Inspection:
    - .1 Contractor: Conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .2 Notify Departmental Representative, in writing, of satisfactory completion of Contractor's inspection; submit verification that corrections have been made.
    - .3 Request Departmental Representative 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, indicating that tasks have been performed as follows:
    - .1 Work: Completed and inspected for compliance with Contract Documents.
    - .2 Defects: Corrected and deficiencies completed.
    - .3 Equipment and systems: Tested, adjusted, balanced, and fully operational.
    - .4 Certificates required by Fire Commissioner and Utility companies: Submitted.
    - .5 Operation of systems: Demonstrated to designated personnel.
    - .6 Work: Complete and ready for final inspection.
  - .4 Final Inspection:
    - .1 When completion tasks have been completed, request final inspection of Work by Departmental Representative and Contractor.
    - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

**1.2 FINAL CLEANING**

- .1 Clean in accordance with Section 01 74 00 - Cleaning. Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

**END OF SECTION**



**Part 1 General**

**1.1 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
  - .1 Convene meeting one week prior to contract completion with Contractor's Representative and Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:
    - .1 Verify Project requirements.
    - .2 Review warranty requirements.
  - .2 Departmental Representative to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
  - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

**1.2 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit three print and three electronic final copies of operation and maintenance manuals, in English, to the Departmental Representative.
  - .1 Provide electronic O & M manuals on CD or DVD.
- .3 Provide spare parts, maintenance materials, and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source, and quality of products supplied.

**1.3 ELECTRICAL SUBMITTALS**

- .1 For submittals related to Electrical work, refer to Section 26 05 05.

**1.4 FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: Vinyl, hard covered, 3 'D' ring, with spine and face pockets.
  - .1 When multiple binders are used, correlate data into related consistent groupings.
- .3 Text: Manufacturer's printed data, or typewritten data.

## **1.5 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 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 local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to 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.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.
- .6 Training: refer to Section 01 79 00 - Demonstration and Training.

## **1.6 AS-BUILT DOCUMENTS AND SAMPLES**

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store as-built documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.
- .3 Label as-built documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "AS-BUILT DOCUMENTS" in neat, large, printed letters.
- .4 Maintain as-built documents in clean, dry and legible condition.
  - .1 Do not use as-built documents for construction purposes.

- .5 Keep as-built documents and samples available for inspection by Departmental Representative.

## **1.7 RECORDING INFORMATION ON PROJECT AS-BUILT DOCUMENTS**

- .1 Record as-built information on drawings and in designated copy of Project Manual provided by Departmental Representative.
- .2 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .3 Maintain information during construction on project site drawings and accurately record deviations of newly installed or existing works from Contract documents.
- .4 Use red felt tip marking pens for recording information.
- .5 Mark on one set of prints and at completion of project and prior to final inspection; neatly transfer notations to second set.
- .6 Ensure but do not limit recording of following information on as-built drawings:
  - .1 Locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
  - .2 Changes made by Change Order.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Details not on original Contract Drawings.
  - .6 References to related shop drawings and modifications.
- .7 Incorporate as-built information into CAD drawings.
- .8 Submit as-built drawings to Departmental Representative.
  - .1 Provide in electronic form as CAD .dwg format, on CD or DVD.
- .9 Specifications: 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.

## **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.
- .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 MAINTENANCE MATERIALS**

- .1 Spare Parts:
  - .1 Provide spare parts, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to site; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock 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 site; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.
  - .3 Deliver to site; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.

## **1.10 DELIVERY, STORAGE, AND HANDLING**

- .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 for review by Departmental Representative.

**1.11 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
  - .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 applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.

- .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
- .7 Cross-reference to warranty certificates as applicable.
- .8 Starting point and duration of warranty period.
- .9 Summary of maintenance procedures required to continue warranty in force.
- .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
- .11 Organization, names and phone numbers of persons to call for warranty service.
- .12 Typical response time and repair time expected for various warranted equipment.
- .3 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.
- .4 Procedure and status of tagging of equipment covered by extended warranties.
- .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
- .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

**END OF SECTION**

**Part 1            General**

**1.1            ADMINISTRATIVE REQUIREMENTS**

- .1    Demonstrate operation and maintenance of equipment and systems to designated personnel two weeks prior to date of substantial performance.
- .2    Departmental Representative: 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 have been performed 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 agreed-upon 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 provided for instruction of each item of equipment or system is adequate for full orientation and training of designated personnel.

**1.2            SUBMITTALS**

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

**1.3 QUALITY ASSURANCE**

- .1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
  - .1 Instruct designated personnel.
  - .2 Provide written report that demonstration and instructions have been completed.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES**

- .1 CSA Z320-11 (R2016) – Building Commissioning Standard.

**1.2 SUMMARY**

- .1 Section Includes:
  - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to functional performance testing of components, equipment, sub-systems, systems, and integrated systems.
- .2 Acronyms:
  - .1 Cx - Commissioning.
  - .2 FPT – Functional Performance Testing.
  - .3 O & M - Operation and Maintenance.

**1.3 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 Functional Performance Testing responsibilities have been completed. 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 Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the Project Requirements. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the Owner's Project Requirements may be included.
- .3 Project Requirements: Dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the design. It is initially the outcome of the programming and conceptual design phases.
- .4 Contractor to appoint Contractor's Cx agent and assist 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 interactively 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.

- .5 Design Criteria: Client's requirements or determined by designer. To meet Project functional and operational requirements.

#### **1.4 COMMISSIONING OVERVIEW**

- .1 Section 01 91 31 - Commissioning (Cx) Plan.
- .2 For Cx responsibilities refer to Section 01 91 31 - Commissioning (Cx) Plan.
- .3 Cx to be a line item of Contractor's cost breakdown.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .5 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages that are addressed during Construction and Cx stages to ensure the built facility 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.
- .6 Departmental Representative will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received and reviewed for suitability by Departmental Representative.
  - .2 Equipment, components, and systems have been fully commissioned to design intent within context of design requirements.
  - .3 Final O&M and Training Manual: Received, reviewed and accepted by Departmental Representative for suitability.
  - .4 Completion of training session to designated Operational and Maintenance staff.
  - .5 Successful completion of system tests, life safety support systems tests, and after meeting requirements of authority having jurisdiction.

#### **1.5 NON-CONFORMANCE TO FUNCTIONAL PERFORMANCE 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 non-functional 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 Contractor.

#### **1.6 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, and 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 Have Cx schedules up-to-date.
  - .7 Ensure systems have been cleaned thoroughly.
  - .8 Ensure "As-Built" system schematics are available.
- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

## **1.7 CONFLICTS**

- .1 Report conflicts between requirements of this section and other sections to Departmental Representative and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

## **1.8 SUBMITTALS**

- .1 Submittals: In accordance with Section 01 33 00 - Submittal Procedures.
  - .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 8 weeks prior to start of Cx.
  - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.
  - .4 Provide additional documentation relating to Cx process required by Departmental Representative.

## **1.9 COMMISSIONING DOCUMENTATION**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) 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.

#### **1.10 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.19 - Construction Progress Schedules - Bar (GANTT) Chart. Update schedule as necessary during the work to reflect progress on components and systems.
- .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.
  - .4 Training.

#### **1.11 COMMISSIONING MEETINGS**

- .1 Convene Cx meetings following project meetings: Section 01 32 16.19 - Construction Progress Schedules - Bar (GANTT) Chart and as specified.
- .2 Purpose: 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 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 functional testing period.
- .6 Meeting will be chaired by Contractor, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

#### **1.12 TESTING**

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

#### **1.13 WITNESSING OF TESTING**

- .1 Provide 14 days notice prior to commencement.
- .2 Departmental Representative to witness testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

#### **1.14 MANUFACTURER'S INVOLVEMENT**

- .1 Factory testing: Manufacturer to:
  - .1 Coordinate time and location of testing.
  - .2 Provide testing documentation for approval by Departmental Representative.
  - .3 Arrange for Departmental Representative to witness tests.
  - .4 Confirm review of test results and documentation from Departmental Representative before delivery to site.
- .2 Obtain manufacturers' installation and operations instructions and review with Departmental Representative prior to testing of components, equipment, and systems.
  - .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 testing.
- .3 Integrity of warranties:
  - .1 Use manufacturer's trained 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.
- .4 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.

#### **1.15 PROCEDURES**

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting testing and Cx.
- .2 Conduct testing in following distinct phases:
  - .1 Included in delivery and installation:
    - .1 Verification of conformity to specification, approved shop drawings and completion of static verification report forms.
    - .2 Visual inspection of quality of installation.
  - .2 Operational testing: Document equipment performance.
  - .3 System functional performance testing: Include repetition of tests after correcting deficiencies.
  - .4 Post-substantial verification: 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 functional performance testing forms.

- .5 Failure to follow accepted testing procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment testing 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 remove from site and replace with new.
    - .2 Subject new equipment/systems to specified testing procedures.

#### **1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

- .1 Operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer, develop written maintenance program and submit to Departmental Representative for acceptance 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 testing or functional performance testing produce unacceptable results, repair, replace, or repeat functional performance testing procedures until acceptable results are achieved.
- .2 Provide labour and materials, assume costs for re-commissioning.

#### **1.18 START OF COMMISSIONING**

- .1 Notify Departmental Representative at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting functional performance testing of systems have been completed.

#### **1.19 INSTRUMENTS / EQUIPMENT**

- .1 Submit to Departmental Representative for review:
  - .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 FUNCTIONAL PERFORMANCE TESTING**

- .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.

## **1.21 WITNESSING COMMISSIONING**

- .1 Departmental Representative to witness activities and verify results.

## **1.22 AUTHORITIES HAVING JURISDICTION**

- .1 Where specified 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 Departmental Representative within 5 days of test, with Cx report.

## **1.23 COMMISSIONING CONSTRAINTS**

- .1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

## **1.24 EXTRAPOLATION OF RESULTS**

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

## **1.25 EXTENT OF VERIFICATION**

- .1 Provide labour 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 and instrumentation.
- .4 Review and repeat commissioning of systems if inconsistencies are found in more than 20% of reported results.
- .5 Perform additional commissioning until results are acceptable to Departmental Representative.

#### **1.26 REPEAT VERIFICATIONS**

- .1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:
  - .1 Verification of reported results fail to receive Departmental Representative's approval.
  - .2 Repetition of second verification again fails to receive approval.
  - .3 Departmental Representative deems Contractor's request for second verification was premature.

#### **1.27 SUNDRY CHECKS AND ADJUSTMENTS**

- .1 Make adjustments and changes that become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

#### **1.28 DEFICIENCIES, FAULTS, DEFECTS**

- .1 Correct deficiencies found during testing and Cx to satisfaction of Departmental Representative.
- .2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

#### **1.29 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 Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

#### **1.30 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.

#### **1.31 TRAINING**

- .1 In accordance with Section 01 91 41 - Commissioning (Cx) - Training.



**1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

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

**1.33 OCCUPANCY**

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

**1.34 FUNCTIONAL PERFORMANCE TESTING 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.

**1.35 DEPARTMENTAL REPRESENTATIVE'S PERFORMANCE TESTING**

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

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Description of overall structure of Cx Plan and roles and responsibilities of Cx team.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CSA Z320-11, Building Commissioning.
- .2 Underwriters' Laboratories of Canada (ULC)

**1.3 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 Facility user and 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 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 FPT – Functional Performance Testing.
- .3 MSDS - Material Safety Data Sheets.
- .4 WHMIS - Workplace Hazardous Materials Information System.
- .5 Commissioning terms used in this Section:
  - .1 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to occupancy, weather conditions, need for heating/cooling loads.

#### **1.4 DEVELOPMENT OF 100% CX PLAN**

- .1 Cx Plan to be 95% completed by Departmental Representative and transmit to the Contractor.
- .2 Cx Plan to be 100% completed within 8 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.
- .3 Submit completed Cx Plan for review and further obtain Departmental Representative's written approval.

#### **1.5 REFINEMENT OF CX PLAN**

- .1 During construction phase, revise, refine and update Cx Plan to include:
  - .1 Changes resulting from Client program modifications.
  - .2 Approved design and construction changes.
- .2 Revise, refine, and update every 4 weeks during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.
- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

#### **1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM**

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members:
  - .1 Departmental Representative: During construction, will conduct periodic site reviews to observe general progress.
  - .2 Departmental Representative: Ensures Cx activities are carried out to ensure delivery of a fully operational project including:

- .1 Review of Cx documentation from operational perspective.
- .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
- .3 Protection of health, safety, and comfort of occupants and O & M personnel.
- .4 Monitoring of Cx activities, training, development of Cx documentation.
- .5 Work closely with members of Cx Team.
- .3 Departmental Representative is responsible for:
  - .1 Organizing Cx.
  - .2 Monitoring operations Cx activities.
  - .3 Witnessing, certifying accuracy of reported results.
  - .4 Witnessing and certifying other tests.
  - .5 Ensuring implementation of final Cx Plan.
  - .6 Performing verification of performance of installed systems and equipment.
  - .7 Implementation of Training Plan.
- .4 Construction Team: Contractor, sub-contractors, suppliers, and support disciplines; is responsible for construction/installation in accordance with contract documents, including:
  - .1 Testing.
  - .2 Performance of Cx activities.
  - .3 Delivery of training and Cx documentation.
  - .4 Assigning one person as point of contact with Departmental Representative and PWGSC Cx Manager for administrative and coordination purposes.
- .5 Contractor's Cx agent implements specified Cx activities including:
  - .1 Revise, refine and update Cx plan.
  - .2 Demonstrations.
  - .3 Training.
  - .4 Testing.
  - .5 Preparation, submission of test reports.

## **1.7 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 Include functional performance testing.

- .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.
- .2 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

## **1.8 EXTENT OF CX**

- .1 The following list outlines the extent of Cx.
  - .1 Structural and Architectural systems:
    - .1 Doors, related hardware:
      - .1 New door hardware.
    - .2 Gun port operation and function.
  - .2 Commission electrical systems and equipment:
    - .1 Fire alarm system.
    - .2 Other systems and equipment:
      - .1 PALS system.

## **1.9 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.

## **1.10 DELIVERABLES RELATING TO THE CX PROCESS**

- .1 General:
  - .1 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 functional performance testing.
- .3 Deliverables: provide:
  - .1 Cx Specifications.
  - .2 Pre-Cx activities and documentation for systems, and equipment.
  - .3 Completed static verification forms.
  - .4 Completed testing report forms.
  - .5 Completed functional performance testing report forms.
  - .6 Results of functional performance testing and Inspections.
  - .7 Description of Cx activities and documentation.
  - .8 Description of Cx of integrated systems and documentation.
  - .9 Tests performed by Departmental Representative.
  - .10 Training Plans.
  - .11 Cx Reports.
  - .12 Prescribed activities during warranty period.
  - .13 Cx Issues log.
- .4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.
- .5 Departmental Representative to participate.

#### **1.11 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION**

- .1 Items listed in this Cx Plan include the following:
  - .1 Pre-testing inspections: by Departmental Representative prior to permission to test and rectification of deficiencies to Departmental Representative's satisfaction.
  - .2 Departmental Representative to use approved check lists.
  - .3 Departmental Representative will monitor some of these pre-test inspections.
  - .4 Include completed documentation with Cx report.
- .2 Pre-Cx activities – ARCHITECTURAL AND STRUCTURAL:
  - .1 Structural and Architectural systems:
    - .1 Doors, related hardware:
      - .1 New door hardware.
    - .2 Gun port operation and function.
- .3 Pre-Cx activities - ELECTRICAL:
  - .1 Commission electrical systems and equipment:

- .1 Fire alarm system.
  - .1 Fire alarm systems: Test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements.
- .2 Other systems and equipment:
  - .1 PALS system.

#### **1.12 TESTING**

- .1 Test components, equipment and systems.
- .2 Departmental Representative to monitor some testing activities.
  - .1 Rectify deficiencies to satisfaction of Departmental Representative.
- .3 Functional Performance Testing:
  - .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 Departmental Representative to witness and certify reported results using approved static verification and function performance testing forms.
  - .4 Departmental Representative to approve completed function performance testing.
  - .5 Departmental Representative reserves right to verify up to 30% of reported results at random.
  - .6 Failure of randomly selected item shall result in rejection of function performance testing report or report of system testing.

#### **1.13 CX ACTIVITIES AND RELATED DOCUMENTATION**

- .1 Perform Cx by specified Cx agency using procedures developed by Consultant and acceptable to Departmental Representative.
- .2 Departmental Representative to monitor Cx activities.
- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using acceptable function performance testing forms.
- .4 Consultant to witness, certify reported results of, Cx activities and forward to Departmental Representative.
- .5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

#### **1.14 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION**

- .1 Cx to be performed by specified Cx specialist, using procedures developed by Consultant and acceptable to Departmental Representative.
- .2 Tests to be witnessed by Consultant and documented on acceptable report forms.

- .3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be certified by Consultant and submitted to Departmental Representative for review.
- .4 Departmental Representative reserves right to verify percentage of reported results.
- .5 Identification:
  - .1 In later stages of Cx, before hand-over and acceptance, Departmental Representative, Consultant, Contractor, Project Manager, Property Manager and Cx Manager to co-operate to complete inventory data sheets and provide assistance to PWGSC in full implementation of MMS identification system of components, equipment, sub-systems, systems.

#### **1.15 STATIC VERIFICATION CHECK LISTS**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms.

#### **1.16 FUNCTIONAL PERFORMANCE TESTING FORMS**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms.

#### **1.17 DELIVERABLES RELATING TO ADMINISTRATION OF CX**

- .1 General:
  - .1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

#### **1.18 CX SCHEDULES**

- .1 Prepare detailed critical path Cx Schedule and submit to 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 Cx agents' credentials: 30 days before start of Cx.
    - .3 Cx procedures: 4 weeks after award of contract.
    - .4 Cx Report format: 6 weeks after contract award.
    - .5 Submission of list of instrumentation with relevant certificates: 14 days before start of Cx.
    - .6 Notification of intention to start Cx: 14 days before start of Cx.
    - .7 Notification of intention to start Cx of integrated systems: After Cx of related systems is completed 14 days before start of integrated system Cx.
    - .8 Identification of deferred Cx.
    - .9 Implementation of training plans.
    - .10 Cx reports: Immediately upon successful completion of Cx.



- .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Departmental Representative.
- .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 Departmental Representative will monitor progress of Cx against this schedule.
- .4 CX Schedules for Electrical Systems:
  - .1 A schedule of commissioning activities will be produced by contractor in a bar chart format to a scale that will ensure legibility. Bar chart to show sequences of testing equipment and systems, interrelationship between tests, duration of tests and training periods. Show commissioning resources committed to project to ensure completion by prescribed dates, Training Plan and Commissioning Documentation Plan.
  - .2 Fire alarm systems: Verify only after all aspects of life safety and security systems are complete. Testing to be monitored by Departmental Representative and include complete verification in accordance with CAN/ULC requirements. After receipt by Commissioning Manager of Commissioning Report, commissioning specialist will demonstrate all devices and zones to Commissioning Manager, Project Manager, and Property Manager.
  - .3 Include commissioning requirements in the construction specifications.
  - .4 Submit reports of these tests, witnessed and certified by the Departmental Representative, to Commissioning Manager who will verify reported results.
  - .5 Upon completion of commissioning to satisfaction of the Commissioning Manager, lock control devices in their final positions, indelibly mark settings and include in Commissioning Reports.

#### **1.19 CX REPORTS**

- .1 Submit reports of tests, witnessed and certified by Consultant, to Departmental Representative who will verify reported results.
- .2 Include completed and certified function performance testing reports in properly formatted Cx Reports.
- .3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

#### **1.20 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:

#### **1.21 TRAINING PLANS**

- .1 Refer to Section 01 91 41 - Commissioning (Cx) - Training.

**1.22 FINAL SETTINGS**

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

**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 STATIC VERIFICATION/START-UP CHECK LISTS**

- .1 Include the following data:
  - .1 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 necessary to prepare for start-up and functional performance testing, and used during operation and maintenance of equipment.
  - .2 Product manufacturer's installation instructions and recommended checks.
  - .3 Special procedures as specified in relevant technical sections.
  - .4 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Prior to functional performance testing of systems, complete items on static verification and start-up forms related to systems and obtain Departmental Representative's approval.
- .3 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative, supplemental additional data lists will be required for specific project conditions.
- .4 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .5 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative. Check lists will be required during Commissioning and will be included in O & M at completion of project.
- .6 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 FUNCTIONAL PERFORMANCE TESTING FORMS**

- .1 Functional performance testing 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 Functional performance testing forms include those developed by Contractor records measured data and readings taken during functional testing and functional performance testing procedures.

- .3 Prior to functional performance testing of integrated system, complete functional performance testing forms of related systems and obtain Departmental Representative's approval.

#### **1.4 SAMPLES OF COMMISSIONING FORMS**

- .1 Consultant 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.

#### **1.5 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS**

- .1 When additional forms are required, but are not available from Consultant, develop appropriate verification forms and submit to Departmental Representative for approval prior to use.
  - .1 Additional commissioning forms to be in same format as provided by Consultant.

#### **1.6 COMMISSIONING FORMS**

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems. Refer to samples as appended after this section.
- .2 Strategy for Use:
  - .1 Consultant 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 to 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 Departmental Representative.
  - .9 Submit immediately after tests are performed.
  - .10 Report 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.
  - .13 Forms to be both hard copy and electronic format with typewritten results in Systems Operation Manual.

**1.7 LANGUAGE**

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

**END OF SECTION**

# ARCHITECTURAL FIELD REVIEW AND COMPLIANCE - COMMON INTERIOR - DOOR HARDWARE

## Static Verification

REVISION #: \_\_\_\_\_

NAME: \_\_\_\_\_

COMPANY: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CUSTOMER: \_\_\_\_\_

PROJECT: \_\_\_\_\_

FILE NUMBER: \_\_\_\_\_

DATE: DD / MM / YYYY

### NAMEPLATE

|          |                        |                   |  |
|----------|------------------------|-------------------|--|
| SUBJECT  | <b>Common Interior</b> | LOCATION          |  |
| ASSEMBLY | <b>Door Hardware</b>   | DRAWING REFERENCE |  |

| COMPONENTS  | SPECIFIED | SHOP DRAWINGS | INSTALLED |
|---|-----------|---------------|-----------|
| Hardware - lock/latch set                           |           |               |           |
| Hardware - closer (manual)                          |           |               |           |
| Hardware - closer (power assist)                    |           |               |           |
| Remote lock/unlock feature (security)               |           |               |           |
| Remote lock/unlock feature (fire alarm/life safety) |           |               |           |
| Other accessories                                   |           |               |           |

### Hardware - lock/latch set

| Architectural Field Review & Compliance Activity                     | Performance Criteria | STATUS |    |     | COMMENTS |
|--|----------------------|--------|----|-----|----------|
|  |                      | YES    | NO | N/A |          |
| Construction checklists prepared                                     |                      |        |    |     |          |
| Construction checklists completed                                    |                      |        |    |     |          |
| Field review reports completed                                       |                      |        |    |     |          |
| Compliance test reports completed                                    |                      |        |    |     |          |
| Deficiency (Issues) log created                                      |                      |        |    |     |          |
| Deficiency Log items addressed                                       |                      |        |    |     |          |
| Verify training completed  |                      |        |    |     |          |
| Review required maintenance and data, and systems operations manuals |                      |        |    |     |          |
| <b>INTERIM ACCEPTANCE</b>  |                      |        |    |     |          |
| Outstanding Cx issues addressed or explained                         |                      |        |    |     |          |
| <b>FINAL ACCEPTANCE</b>  |                      |        |    |     |          |

### Hardware - closer (manual)

| Architectural Field Review & Compliance Activity | Performance Criteria | STATUS |    |     | COMMENTS |
|--|----------------------|--------|----|-----|----------|
|  |                      | YES    | NO | N/A |          |
| Construction checklists prepared                 |                      |        |    |     |          |
| Construction checklists completed                |                      |        |    |     |          |
| Field review reports completed                   |                      |        |    |     |          |
| Compliance test reports completed                |                      |        |    |     |          |
| Deficiency (Issues) log created                  |                      |        |    |     |          |
| Deficiency Log items addressed                   |                      |        |    |     |          |

# ARCHITECTURAL FIELD REVIEW AND COMPLIANCE - COMMON INTERIOR - DOOR HARDWARE

## Static Verification

REVISION #: \_\_\_\_\_

NAME: \_\_\_\_\_

COMPANY: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CUSTOMER: \_\_\_\_\_

PROJECT: \_\_\_\_\_

FILE NUMBER: \_\_\_\_\_

DATE: \_\_\_\_\_ DD / MM / YYYY

|  |  |  |  |  |  |
|--|--|--|--|--|--|
| Verify training completed  |  |  |  |  |  |
| Review required maintenance and data, and systems operations manuals |  |  |  |  |  |
| <b>INTERIM ACCEPTANCE</b>  |  |  |  |  |  |
| Outstanding Cx issues addressed or explained                         |  |  |  |  |  |
| <b>FINAL ACCEPTANCE</b>  |  |  |  |  |  |

| Hardware - closer (power assist)                                     |                      |        |    |     |          |
|--|----------------------|--------|----|-----|----------|
| Architectural Field Review & Compliance Activity                     | Performance Criteria | STATUS |    |     | COMMENTS |
|  |                      | YES    | NO | N/A |          |
| Construction checklists prepared                                     |                      |        |    |     |          |
| Construction checklists completed                                    |                      |        |    |     |          |
| Field review reports completed                                       |                      |        |    |     |          |
| Compliance test reports completed                                    |                      |        |    |     |          |
| Deficiency (Issues) log created                                      |                      |        |    |     |          |
| Deficiency Log items addressed                                       |                      |        |    |     |          |
| Verify training completed  |                      |        |    |     |          |
| Review required maintenance and data, and systems operations manuals |                      |        |    |     |          |
| <b>INTERIM ACCEPTANCE</b>  |                      |        |    |     |          |
| Outstanding Cx issues addressed or explained                         |                      |        |    |     |          |
| <b>FINAL ACCEPTANCE</b>  |                      |        |    |     |          |

| remote lock/unlock feature (security)                                |                      |        |    |     |          |
|--|----------------------|--------|----|-----|----------|
| Architectural Field Review & Compliance Activity                     | Performance Criteria | STATUS |    |     | COMMENTS |
|  |                      | YES    | NO | N/A |          |
| Construction checklists prepared                                     |                      |        |    |     |          |
| Construction checklists completed                                    |                      |        |    |     |          |
| Field review reports completed                                       |                      |        |    |     |          |
| Compliance test reports completed                                    |                      |        |    |     |          |
| Deficiency (Issues) log created                                      |                      |        |    |     |          |
| Deficiency Log items addressed                                       |                      |        |    |     |          |
| Verify training completed  |                      |        |    |     |          |
| Review required maintenance and data, and systems operations manuals |                      |        |    |     |          |
| <b>INTERIM ACCEPTANCE</b>  |                      |        |    |     |          |
| Outstanding Cx issues addressed or explained                         |                      |        |    |     |          |
| <b>FINAL ACCEPTANCE</b>  |                      |        |    |     |          |

# ARCHITECTURAL FIELD REVIEW AND COMPLIANCE - COMMON INTERIOR - DOOR HARDWARE

## Static Verification

REVISION #: \_\_\_\_\_

NAME: \_\_\_\_\_

COMPANY: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CUSTOMER: \_\_\_\_\_

PROJECT: \_\_\_\_\_

FILE NUMBER: \_\_\_\_\_

DATE: DD / MM / YYYY

| Remote lock/unlock feature (fire alarm/life safety)                  |                      |        |    |     |          |
|--|----------------------|--------|----|-----|----------|
| Architectural Field Review & Compliance Activity                     | Performance Criteria | STATUS |    |     | COMMENTS |
|  |                      | YES    | NO | N/A |          |
| Construction checklists prepared                                     |                      |        |    |     |          |
| Construction checklists completed                                    |                      |        |    |     |          |
| Field review reports completed                                       |                      |        |    |     |          |
| Compliance test reports completed                                    |                      |        |    |     |          |
| Deficiency (Issues) log created                                      |                      |        |    |     |          |
| Deficiency Log items addressed                                       |                      |        |    |     |          |
| Verify training completed  |                      |        |    |     |          |
| Review required maintenance and data, and systems operations manuals |                      |        |    |     |          |
| <b>INTERIM ACCEPTANCE</b>  |                      |        |    |     |          |
| Outstanding Cx issues addressed or explained                         |                      |        |    |     |          |
| <b>FINAL ACCEPTANCE</b>  |                      |        |    |     |          |
| <b>Other Accessories</b>   |                      |        |    |     |          |
| Architectural Field Review & Compliance Activity                     | Performance Criteria | STATUS |    |     | COMMENTS |
|  |                      | YES    | NO | N/A |          |
| Construction checklists prepared                                     |                      |        |    |     |          |
| Construction checklists completed                                    |                      |        |    |     |          |
| Field review reports completed                                       |                      |        |    |     |          |
| Compliance test reports completed                                    |                      |        |    |     |          |
| Deficiency (Issues) log created                                      |                      |        |    |     |          |
| Deficiency Log items addressed                                       |                      |        |    |     |          |
| Verify training completed  |                      |        |    |     |          |
| Review required maintenance and data, and systems operations manuals |                      |        |    |     |          |
| <b>INTERIM ACCEPTANCE</b>  |                      |        |    |     |          |
| Outstanding Cx issues addressed or explained                         |                      |        |    |     |          |
| <b>FINAL ACCEPTANCE</b>  |                      |        |    |     |          |

## GENERAL COMMENTS:



ARCHITECTURAL FIELD REVIEW AND COMPLIANCE - COMMON  
INTERIOR - DOOR HARDWARE

Static Verification

REVISION #: \_\_\_\_\_

NAME: \_\_\_\_\_

COMPANY: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CUSTOMER: \_\_\_\_\_

PROJECT: \_\_\_\_\_

FILE NUMBER: \_\_\_\_\_

DATE: \_\_\_\_\_ DD / MM / YYYY

| POSITION/TITLE                            | SIGNATURE | DATE |
|---|-----------|------|
| Building Owner/Representative             |           |      |
| Building Operations and Maintenance Staff |           |      |
| Cx Authority/ Commissioning Provider      |           |      |
| Contractors/Subcontractor                 |           |      |
|   |           |      |

## APPENDIX C (INFORMATIVE) – FIRE ALARM SYSTEM VERIFICATION REPORTS

(Reference: Subsection 3.1-Note, Clause 3.2.1, 3.2.2)

YES ☐ = Tested Correctly    NO ☐ = Did not test correctly    N/A ☐ = Not applicable

FUNCTION OR FEATURE NOT PROVIDED ON THIS FIRE  
ALARM SYSTEM

### C1. FIRE ALARM SYSTEM VERIFICATION REPORT

(Reference: Clause 3.1.6, 3.1.7, 3.2.2)

|                      |  |               |  |  |
|----------------------|--|---------------|--|--|
| Building name:       |  | Date:         |  |  |
| Address              |  |               |  |  |
|                      |  |               |  |  |
|                      |  |               |  |  |
| System manufacturer: |  | Model number: |  |  |

|   |  |                              |                             |                              |
|---|--|------------------------------|-----------------------------|------------------------------|
| A | System provides single-stage operation.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | -                            |
| B | System provides two-stage operation.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | -                            |
| C | The entire <i>fire alarm system</i> has been verified in accordance with CAN/ULC-S537, Verification of Fire Alarm Systems.               | Yes <input type="checkbox"/> | No <input type="checkbox"/> | -                            |
| D | This is a partial verification for a partial occupancy.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| E | This is a partial verification for a <i>fire alarm system</i> that has been replaced in stages.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| F | This is a verification of a portion of an existing <i>fire alarm system</i> verified in accordance with Section 6, System Modifications. | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| G | Installed in accordance with the <i>design</i> and CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems.                    | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| H | The <i>fire alarm system</i> documentation is on site and includes a description of the system.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| I | The <i>fire alarm system</i> is fully functional.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| J | Comments   |                              |                             |                              |
|   |  |                              |                             |                              |
|   |  |                              |                             |                              |
| K | A copy of this report will be given to the following, who is the owner or owner's representative for this <i>building</i> :              | Yes <input type="checkbox"/> | No <input type="checkbox"/> | -                            |

This is to certify that the information contained in this Fire Alarm System Verification Report is correct and complete.

Printed Name of Primary or Supervising  
Technician Conducting the Verification

Company

Telephone

Signature of Primary or Supervising Technician  
Conducting the Verification

Identification Number of Primary or  
Supervising Technician Conducting the  
Verification

...Continued C1

---

Printed Name of Technician Conducting the  
Verification

Company

Telephone

Signature of Technician Conducting the  
Verification

Identification Number of Technician  
Conducting the Verification

---

Printed Name of Designer

Company

Telephone

Signature of Designer

## C2. DOCUMENTATION

(Reference: Clause 3.2.3)

C2.1 Documentation for the *fire alarm system* is on site and includes the following description of the *fire alarm system*:

|   |  |                              |                             |                              |
|---|--|------------------------------|-----------------------------|------------------------------|
| A | Instructions for resetting the system and silencing <i>alarm signals</i> .   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | Instructions for silencing the <i>trouble signal</i> and action to be taken when the <i>trouble signal</i> sounds.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | Description of the function of each operating control and indicator on the fire alarm unit.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| D | Description of the area or fire zone protected by each alarm detection circuit (this may be in the form of a list or plan drawing).  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| E | Description of <i>alarm signal</i> operation.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| F | Description of ancillary equipment controlled by the <i>fire alarm system</i> .  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| G | <p>The <i>fire alarm system</i> has a feature for connection for fire department <i>signalling</i>.</p> <p>If connected, indicate the fire <i>signal receiving centre</i>:</p> <hr/> | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

### C3. FIELD DEVICE AND RELATED CIRCUITS – TEST AND INSPECTION

(Reference: Clauses 3.3.1.1, 3.3.1.3, Subsections 3.3.1, 3.3.2, 3.3.3)

|   |  |                              |                             |                              |
|---|--|------------------------------|-----------------------------|------------------------------|
| A | Correct field termination and wiring size.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | Correct circuit polarities.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | An <i>open circuit fault</i> on a conventional device circuit causes a <i>trouble signal</i> .   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| D | Removal of any active or <i>supporting field device</i> circuit causes a <i>trouble signal</i> .   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| E | One contact device and one non-contact device <i>tested</i> for operation and annunciation at the <i>control unit</i> or <i>transponder</i> , when using a <i>field verifying device</i> .   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| F | <i>Class A circuits</i> serving <i>conventional field devices</i> <i>tested</i> for the capability of providing an <i>alarm signal</i> on each side of an <i>open circuit fault</i> connection at an electrically remote point in the circuit. | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| G | <i>Ground fault</i> indications occur when <i>tested</i> at the electrically furthest <i>field device</i> , and do not result in normal to off-normal status change conditions.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| H | <i>Field device</i> at the electrically furthest point from the power source (in every circuit) receives rated power in accordance with manufacturer's <i>specifications</i> .   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| I | Replaceable over-current devices are of correct rating.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| J | Wire type and gauge in accordance with equipment manufacturer's installation wiring at all system termination points   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

## C4. DATA COMMUNICATION LINK TEST

(Reference: Clause 3.2.6, Subsection 3.3.4-Note)

|   |
|---|
| Control unit or transponder location:       |
| Control unit or transponder identification: |
| Data communication link identification:     |

|   |   |                              |                             |                              |
|---|---|------------------------------|-----------------------------|------------------------------|
| A | Each system abnormal condition specified in Table 1, Abnormal System Conditions, <i>tested</i> for each <i>data communication link</i> at the <i>control unit or transponder</i> .  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | <i>Tests</i> for alarm and trouble received under a single <i>ground fault</i> condition conducted on each conductor of that <i>data communication link</i> independently.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | Each conductor in a <i>data communication link</i> , Class A (DCLA) <i>tested</i> for the capability of providing an <i>alarm signal</i> on each side of a single <i>open circuit fault</i> condition.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| D | Where a <i>data communication link</i> serves devices on more than one floor area, impose a wire-to-wire <i>short circuit fault</i> within each floor area and confirm receipt of trouble and alarm condition from another floor area.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| E | Where <i>fault isolation modules</i> are installed in <i>data communication links</i> serving <i>field devices</i> , wiring shorted on the isolated side, <i>annunciation</i> of the fault confirmed, and then a device on the source side operated, and activation confirmed at the <i>control unit or transponder</i> .       | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| F | Where fault isolation in <i>data communication links</i> is provided between <i>control units</i> or <i>transponders</i> , the field wiring shorted between each pair of <i>control units</i> or <i>transponders</i> , in turn, <i>annunciation</i> of the fault confirmed and operation outside the shorted section confirmed. | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

## C5. CONTROL UNIT OR TRANSPONDER RECORD

(Reference: Clause 4.1.1)

### C5.1 CONTROL UNIT OR TRANSPONDER TEST

(Reference: Clauses 3.2.4, 4.2.2.1)

|   |
|---|
| Control unit or transponder location:       |
| Control unit or transponder identification: |

|   |  |                              |                             |                              |
|---|--|------------------------------|-----------------------------|------------------------------|
| A | Power 'on' visual indicator operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | Common visual <i>trouble signal</i> operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | Common audible <i>trouble signal</i> operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| D | <i>Trouble signal</i> silence switch operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| E | <i>Main power supply failure trouble signal</i> operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| F | <i>Ground fault tested</i> on positive and negative initiates <i>trouble signal</i> .  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| G | <i>Alert signal</i> operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| H | <i>Alarm signal</i> operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| I | Automatic transfer from <i>alert signal</i> to <i>alarm signal</i> operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| J | Manual transfer from <i>alert signal</i> to <i>alarm signal</i> operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| K | Automatic transfer from <i>alert signal</i> to <i>alarm signal</i> cancel (acknowledge) feature operates on a two-stage system.    | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| L | <i>Alarm signal</i> silence inhibit function operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| M | <i>Alarm signal</i> manual silence operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| N | <i>Alarm signal</i> silence visual indication operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| O | <i>Alarm signal</i> , when silenced, automatically reinitiates upon subsequent <i>alarm</i> .                                      | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| P | <i>Alarm signal</i> silence automatic cut-out timer.   | Time: _____                  |                             |                              |
| Q | Audible and visual <i>alarm signals</i> programmed and operate per <i>design</i> and <i>specification</i> .                        | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| R | <i>Input circuit</i> , alarm and supervisory operation, including visual indicator operates.                                       | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| S | <i>Input circuit</i> supervision fault causes a trouble indication.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| T | <i>Output circuit</i> alarm indicators operate.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| U | <i>Output circuit</i> supervision fault causes a trouble indication.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| V | Visual indicator test (lamp test) operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| W | Coded signal sequences operate not less than the required number of times and the correct <i>alarm signal</i> operates thereafter. | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

C5.1 continued...

...Continued C5.1

|    |   |                              |                             |                              |
|----|---|------------------------------|-----------------------------|------------------------------|
| X  | Coded signal sequences are not interrupted by <i>subsequent alarms</i> .  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| Y  | <i>Ancillary device</i> control circuit is rated for the intended purpose.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| Z  | <i>Ancillary device</i> by-pass results in <i>trouble signal</i> .  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| AA | <i>Input circuit to output circuit</i> operation, including <i>ancillary device</i> circuits (Refer to Appendix C5.12, Ancillary Device Circuit Test), for correct programme operation, as per <i>design and specification</i> .            | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| BB | <i>Fire alarm system</i> reset operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| CC | <i>Main power supply to emergency power supply</i> transfer operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| DD | <i>Control unit or transponder</i> bonded to <i>ground</i> .  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| EE | <i>Status change confirmation</i> feature ( <i>smoke detectors</i> only) verified.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| FF | Confirm that the alarm transmission to the remote <i>fire signal receiving centre</i> is received.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| GG | Confirm that the supervisory transmission to the <i>fire signal receiving centre</i> is received.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| HH | Confirm that the trouble transmission to the <i>fire signal receiving centre</i> is received.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| II | If connected, record the name and telephone number of the <i>fire signal receiving centre</i> .   | Name: _____                  |                             |                              |
|    |   | Telephone: _____             |                             |                              |
| JJ | Operation of the <i>fire signal receiving centre</i> disconnect means results in a specific trouble indication at the <i>control unit or transponder</i> and transmits a <i>trouble signal</i> to the <i>fire signal receiving centre</i> . | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |



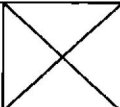
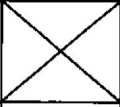
## C5.2 VOICE COMMUNICATION TEST

(Reference: Clauses 3.2.4, 4.2.3.1)

|   |   |                              |                             |                              |
|---|---|------------------------------|-----------------------------|------------------------------|
| A | Power 'on' indicator operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | Common visual <i>trouble signal</i> operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | Common audible <i>trouble signal</i> operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| D | <i>Trouble signal</i> silence switch operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| E | All-call voice paging, including visual indicator, operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| F | <i>Output circuits</i> for selective voice paging, including visual indication operates.                                | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| G | <i>Output circuits</i> for selective voice paging trouble operation, including visual indication, operates.             | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| H | Microphone, including press to talk switch, operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| I | Operation of voice paging does not interfere with initial inhibit time of <i>alert signal</i> and <i>alarm signal</i> . | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| J | All-call voice paging operates (on <i>emergency power supply</i> ).   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| K | Upon failure of one amplifier, system automatically transfers to backup amplifier(s).                                   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| L | Circuits for emergency telephone call-in operation, including audible and visual indication operates.                   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| M | Circuits for emergency telephones for operation, including two-way voice communication, operates.                       | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| N | Circuits for emergency telephone trouble operation, including visual indication, operates.                              | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| O | Emergency telephone verbal communication operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| P | Emergency telephone operable or in-use tone at handset operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

### C5.3 REQUIRED SYSTEM RESPONSE TIMES

(Reference: Clause 4.2.4.1)

|  |   |  |  |   |
|--|---|--|--|---|
| A  | Audible signal devices and visible signal devices operated within 10 s, and<br>Subsequent input operated within 10 s. | Yes <input type="checkbox"/><br>Yes <input type="checkbox"/> | No <input type="checkbox"/><br>No <input type="checkbox"/> |  |
| B  | Remote connection operated within 10 s.   | Yes <input type="checkbox"/>                                 | No <input type="checkbox"/>                                | N/A <input type="checkbox"/>  |
| C  | Releasing device start of sequence operated within 10 s.  | Yes <input type="checkbox"/>                                 | No <input type="checkbox"/>                                | N/A <input type="checkbox"/>  |
| D  | Required annunciation operated within 10 s, and<br>Subsequent input operation within 10 s.                            | Yes <input type="checkbox"/><br>Yes <input type="checkbox"/> | No <input type="checkbox"/><br>No <input type="checkbox"/> |  |
| E  | Required central alarm and control facility operated within 10 s, and<br>Subsequent input operation within 10 s.      | Yes <input type="checkbox"/><br>Yes <input type="checkbox"/> | No <input type="checkbox"/><br>No <input type="checkbox"/> | N/A <input type="checkbox"/>  |
| F  | Ancillary Circuits operated within 10 s, and<br>Subsequent input operation within 30 s.                               | Yes <input type="checkbox"/><br>Yes <input type="checkbox"/> | No <input type="checkbox"/><br>No <input type="checkbox"/> | N/A <input type="checkbox"/>  |
| Note: Refer to Table 2 for required system <i>response times</i> . |   |  |  |   |

## C5.4 CONTROL UNIT OR TRANSPONDER INSPECTION

(Reference: Clause 3.2.4, 4.2.5.1)

|   |
|---|
| Control unit or transponder location:       |
| Control unit or transponder identification: |

|   |   |  |                             |                              |
|---|---|--|-----------------------------|------------------------------|
| A | Input circuit designations correctly identified in relation to connected field devices.   | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | Output circuit designations correctly identified in relation to connected field devices.  | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | Correct designations for common control functions and indicators.   | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| D | Plug-in components and modules securely in place.   | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| E | Plug-in cables securely in place.   | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| F | Record the date, revision and version of <i>firmware</i> and <i>software program</i> .  | <div style="display: flex; justify-content: space-between;"> <div>Date: _____</div> <div>Rev: _____</div> <div>Version: _____</div> </div> |                             |                              |
| G | Control unit and transponder is clean and free of dust and dirt.  | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| H | Fuses in accordance with manufacturer's <i>specification</i> .  | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| I | Control unit or transponder lock functional.  | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| J | Termination points from wiring to <i>field devices</i> secure.  | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| K | Control unit or transponder power disconnects in accordance with C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part I.   | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| L | Main power supply feed wiring in accordance with manufacturer's <i>specifications</i> .   | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| M | Verify <i>control units</i> or <i>transponders</i> with <i>stand alone capability</i> serves the same area for both <i>input circuits</i> and <i>output circuits</i> .  | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| N | Control units or transponders which operate with <i>stand alone capability</i> have signal silence, reset, and trouble silence switches with visual indicators, <i>degraded mode capability</i> and <i>stand alone capability</i> indicators. | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| O | Each <i>control unit</i> or <i>transponder</i> furnished with operating and maintenance instructions, and installation instructions.  | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| P | Control unit or transponder visual indicators comply with Table 3, Visual Indicators-Colour Code.   | Yes <input type="checkbox"/>   | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

## C5.5 LARGE SCALE NETWORK SYSTEMS

(Reference: Clauses 3.2.4, 4.3.2)

|   |   |                              |                             |                              |
|---|---|------------------------------|-----------------------------|------------------------------|
| A | Verify <i>control units</i> or <i>transponders</i> serve the same area for both <i>input circuits</i> and <i>output circuits</i> ;  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | Verify <i>control units</i> or <i>transponders</i> with <i>stand alone capability</i> have signal silence, reset, and trouble silence switches with visual indicators, <i>degraded mode capability</i> and <i>stand alone capability</i> indicators.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | Confirm that between any nodes a single open <i>circuit fault</i> , wire-to-wire short <i>circuit fault</i> , or <i>ground fault</i> on the network results in a <i>trouble signal</i> at each node and continued alarm receipt capability at each node under these conditions.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| D | To test <i>stand alone capability</i> , create a condition of <i>data communication link</i> failure, and confirm each <i>control unit</i> or <i>transponder</i> is capable of receiving an alarm initiation and provides output operation in the area as served by the <i>control unit</i> or <i>transponder degraded mode</i> . | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| E | To test <i>degraded mode capability</i> , create a condition of <i>data communication link</i> failure in two separate locations creating two network segments, and confirm each segment of the network have the following operation:   |                              |                             |                              |
|   | (i) Operate the <i>alarm signals</i> in accordance with the system operating sequence;  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
|   | (ii) Maintain synchronization of <i>control units</i> or <i>transponders</i> for <i>alert signals</i> and <i>alarm signals</i> ;  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
|   | (iii) Operate local relays in <i>control units</i> or <i>transponders</i> connected to <i>ancillary devices</i> ; as required;  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
|   | (iv) Confirm the operation of acknowledge, signal silence, reset and trouble silence switches with visual indicators, <i>degraded mode capability</i> and <i>stand alone capability</i> indicators, are functional for each network segment.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

## C5.6 POWER SUPPLY INSPECTION

(Reference: Clauses 3.2.4, 4.4.1, 4.4.2)

|   |
|---|
| Control unit or transponder location:       |
| Control unit or transponder identification: |

|   |   |                              |                             |                              |
|---|---|------------------------------|-----------------------------|------------------------------|
| A | Conforms with the requirements of CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems; and C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part I, Section 32. | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | Fused in accordance with the manufacturer's marked rating of the system.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | Equipped with the identified disconnect means.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| D | Adequate to meet the requirements of the system.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| E | Power for <i>ancillary devices</i> is taken from a source separate from the <i>fire alarm system control unit</i> or <i>transponder</i> power supply.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| F | Power for <i>ancillary devices</i> is taken from the <i>control unit</i> or <i>transponder</i> that is designed to provide such power.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| G | <i>Ancillary devices</i> , which are powered from <i>control unit</i> or <i>transponder</i> , are recorded.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

## C5.7 EMERGENCY POWER SUPPLY TEST AND INSPECTION

(Reference: Clause 3.2.4, 4.4.4, 4.4.5)

|   |
|---|
| Control unit or transponder location:       |
| Control unit or transponder identification: |

|   |   |  |                             |                              |
|---|---|--|-----------------------------|------------------------------|
| A | Correct battery type as recommended by manufacturer.  | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | Correct battery rating as determined by battery calculations based on full system load.   | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | Battery voltage with <i>main power supply</i> 'on'.   | _____ V dc                                 |                             |                              |
| D | Battery voltage and current with <i>main power supply</i> 'off' and <i>fire alarm system</i> in supervisory condition.  | Voltage: _____ V dc<br>Current: _____ A dc |                             |                              |
| E | Battery voltage and current with <i>main power supply</i> 'off' and <i>fire alarm system</i> in full load alarm condition.  | Voltage: _____ V dc<br>Current: _____ A dc |                             |                              |
| F | Charging current.   | _____ A                                    |                             |                              |
| G | <i>Inspected</i> for physical damage.   | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| H | Terminals cleaned and lubricated.   | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| I | Terminals clamped tightly.  | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| J | Correct electrolyte level.  | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| K | Specific gravity of the electrolyte is within manufacturer's <i>specifications</i> .  | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| L | Electrolyte leakage.  | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| M | Adequately ventilated.  | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| N | Record manufacturer's date code or in-service date.   | Date: _____                                |                             |                              |
| O | Disconnection causes <i>trouble signal</i> .  | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| P | Indicate type of battery <i>tests</i> performed:<br>(i) Required supervisory load for 24 h followed by the required full load operation; or<br>(ii) A silent <i>test</i> by using the load resistor method may be used for the full duration <i>test</i> (Refer to Appendix D1, Silent Test); or<br>(iii) Silent accelerated <i>test</i> . (Refer to Appendix D2, Silent Accelerated Test). | Yes <input type="checkbox"/>               | No <input type="checkbox"/> |                              |
|   |   | Yes <input type="checkbox"/>               | No <input type="checkbox"/> |                              |
|   |   | Yes <input type="checkbox"/>               | No <input type="checkbox"/> |                              |
| Q | Record calculated battery capacity. (Refer to Appendix D3.1-C).   | _____ A•h                                  |                             |                              |
| R | Record battery terminal voltage after completion of <i>tests</i> .  | _____ V dc                                 |                             |                              |
| S | Battery voltage not less than 85% of its rating after the <i>tests</i> .  | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| T | Generator provides power to the AC circuit serving the <i>fire alarm system</i> .   | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| U | Trouble condition at the emergency generator results in an audible common <i>trouble signal</i> and a visual indication at the required <i>annunciator</i> .  | Yes <input type="checkbox"/>               | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

## C5.8 ANNUNCIATOR AND REMOTE TROUBLE SIGNAL UNIT TEST AND INSPECTION

(Reference: Clauses 3.2.5, 4.5.1)

|  |
|--|
| Annunciator or remote <i>trouble signal</i> unit location:       |
| Annunciator or remote <i>trouble signal</i> unit identification: |

|   |   |                              |                             |                              |
|---|---|------------------------------|-----------------------------|------------------------------|
| A | Power 'on' indicator operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | Individual alarm and supervisory <i>input zone</i> clearly indicated and separately designated.                           | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | Individual alarm and supervisory <i>input zone</i> designation labels are properly identified.                            | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| D | Common <i>trouble signal</i> operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| E | Visual indicator <i>test</i> (lamp <i>test</i> ) operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| F | Input wiring from <i>control unit</i> or <i>transponder</i> is supervised.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| G | <i>Alarm signal</i> silence visual indicator operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| H | Switches for ancillary functions operate as per <i>design</i> and <i>specification</i> .                                  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| I | Ancillary functions visual indicators operate.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| J | Manual activation of <i>alarm signal</i> and indication operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| K | Displays are visible in installed location.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| L | Operates on emergency power.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| M | Visual indicators comply with Table 3, Visual Indicators-Colour Code.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| N | Multi-line <i>sequential display</i> operates as per Appendix C5.9 (Annunciators or Sequential Displays), where utilized. | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

## C5.9 ANNUNCIATORS OR SEQUENTIAL DISPLAYS

(Reference: Clauses 3.2.5, 4.5.2, Appendix C5.8-N)

Annunciator or sequential display location:

Annunciator or sequential display identification:

|   |  |                              |                             |   |
|---|--|------------------------------|-----------------------------|---|
| A | Power 'on' indicator operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |
| B | Individual alarm and supervisory <i>zone</i> indication operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/><br>(See exception) |
|   | <b>Exception:</b> Operation of each individual alarm and supervisory <i>zone</i> indication gives the identical indication, or lights the identical indicators at the other <i>annunciator(s)</i> and <i>sequential display(s)</i> . | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |
|   | Specify Method of confirmation: _____<br>_____   |                              |                             |   |
|   | Minimum of one alarm <i>zone</i> and one supervisory <i>zone</i> tested per <i>annunciator</i> or <i>sequential display</i> to confirm operation.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |
| C | Individual alarm and supervisory <i>zone</i> designation labels are properly identified.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |
| D | Common <i>trouble signal</i> operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |
| E | Visual indicator <i>test</i> (lamp <i>test</i> ) operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |
| F | Input wiring from <i>control unit</i> or <i>transponder</i> is supervised.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |
| G | <i>Alarm signal</i> silence visual indicator operates.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |
| H | Switches for ancillary functions operate as per <i>design</i> and <i>specification</i> .   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |
| I | Ancillary function visual indicators operate.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |
| J | Manual activation of <i>alarm signal</i> and indication operates.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |
| K | Displays are visible in installed location.  | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/>                    |



## C5.10 REMOTE TROUBLE SIGNAL UNIT TEST AND INSPECTION

(Reference: Clauses 3.2.5, 4.5.3)

|   |
|---|
| Remote <i>trouble signal</i> unit location:       |
| Remote <i>trouble signal</i> unit identification: |

|   |  |                              |                             |                              |
|---|--|------------------------------|-----------------------------|------------------------------|
| A | Input wiring from <i>control unit</i> or <i>transponder</i> is supervised. | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | Visual <i>trouble signal</i> operates.                                     | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | Audible <i>trouble signal</i> operates.                                    | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| D | Audible <i>trouble signal</i> silence operates.                            | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

## C5.11 PRINTER TEST

(Reference: Clauses 3.2.5, 4.6.1)

|                         |
|-------------------------|
| Printer location:       |
| Printer identification: |

|   |   |                              |                             |                              |
|---|---|------------------------------|-----------------------------|------------------------------|
| A | Operates as per <i>design</i> and <i>specification</i> .          | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| B | <i>Zone</i> of each alarm initiating device is correctly printed. | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
| C | Rated voltage is present.   | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

## C5.12 ANCILLARY DEVICE CIRCUIT TEST

(Reference: Clauses 4.2.2.1-AA, C5.1-AA)

| RECORD SPECIFIC TYPE OF ANCILLARY CIRCUIT | OPERATION OF ANCILLARY CIRCUIT CONFIRMED |                             |                              |
|---|--|-----------------------------|------------------------------|
|   | Yes <input type="checkbox"/>             | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
|   | Yes <input type="checkbox"/>             | No <input type="checkbox"/> | N/A <input type="checkbox"/> |
|   | Yes <input type="checkbox"/>             | No <input type="checkbox"/> | N/A <input type="checkbox"/> |

Note: The *tests* reported on this Form do not include the actual operational *test* of *ancillary devices*.

## C6. FIELD DEVICE RECORD

(Reference: Clauses 3.2.7, 5.1.1)

### C6.1 FIELD DEVICE TESTING - LEGEND AND NOTES

(Reference: C6.2, C6.3)

| DEVICE | DESCRIPTION   | TYPE           | MODEL NO.      |
|--------|---|----------------|----------------|
| M      | <i>Manual Pull Station</i>  |                |                |
| RHT    | <i>Heat Detector, Restorable</i>  |                |                |
| HT     | <i>Heat Detector, Non-restorable</i>  |                |                |
| S      | <i>Smoke Detector</i><br><br>Sensitivity Test Method or Test Equipment:<br>Model/Method: _____<br><br>Manufacturer Sensitivity Range:<br>Sensitivity Range: _____ | Not applicable | Not applicable |
| RI     | <i>Remote Indicator Unit</i>  |                |                |
| DS     | <i>Duct Smoke detector</i>  |                |                |
| --     | <i>Other Type of Detector</i>   |                |                |
| SFD    | <i>Supporting Field Device (Monitor)</i>  |                |                |
| FS     | <i>Sprinkler Flow Switch</i>  |                |                |
| SS     | <i>Sprinkler Supervisory device</i>   |                |                |
| --     | <i>Other Supervisory Devices (Low Pressure, Low Water, Low Temperature, Power Loss, etc.)</i>   |                |                |
| EM     | <i>Fault Isolation Module</i>   |                |                |
| B      | <i>Bell</i>   |                |                |
| H      | <i>Horn</i>   |                |                |
| V      | <i>Visible Signal Device</i>  |                |                |
| SP     | <i>Cone Type Speaker</i>  |                |                |
| HSP    | <i>Horn Type Speaker</i>  |                |                |
| AD     | <i>Ancillary Device</i>   |                |                |
| ET     | <i>Emergency Telephone</i>  |                |                |
| EOL    | <i>End-of-Line Resistor</i>   |                |                |

#### The following notes apply to Appendix C6.2, Individual Device Record:

- NOTE 1: *Smoke detector sensitivity* confirmation or measurement should be recorded in the remarks column.
- NOTE 2: *Smoke detector* cleaning or replacement date should also be recorded in the remarks column.
- NOTE 3: Status Change, including time delay, should be recorded in the remarks column.
- NOTE 4: *Duct smoke detector* pressure differential should be confirmed and recorded in the remarks column.

C6.1 continued...

...Continued C6.1

- NOTE 5: Time delay setting of water flow switch should be recorded in the remarks column.
- NOTE 6: Sprinkler supervisory switches cause trouble condition to be annunciated but not an alarm condition.
- NOTE 7: Upper and lower pressure setting of *supervisory devices* should be recorded in the remarks column.
- NOTE 8: Low temperature setting should be recorded in the remarks column.
- NOTE 9: Identify the specific *ancillary devices* in the remarks column.
- NOTE 10: Identify date *field device* changed in the remarks column.
- NOTE 11: Identify correct *field device* operation (e.g., alarm, trouble, supervisory, annunciation indication).
- NOTE 12: Identify *zone*, circuit number, or address.
- NOTE 13: Identify *conventional field device* locations.
- NOTE 14: Identify *active field device* and supporting *field device*, *data communication link* (DCL), address and location.
- NOTE 15: *Test* and confirm *conventional field device* supervision of wiring.
- NOTE 16: Confirm *field device* free of damage.
- NOTE 17: Confirm *field device* free of foreign substance (e.g. paint).
- NOTE 18: Confirm *field device* mechanically supported independently of the wiring.
- NOTE 19: Confirm *field device* protective dust shields or covers removed.

CAUTION: The *tests* reported on this Form do not include the actual operational *test* of *ancillary devices*.

## C6.2 INDIVIDUAL DEVICE RECORD

(Reference: C6.1)

Building Name: \_\_\_\_\_

Page \_\_\_\_ Of \_\_\_\_

Date: \_\_\_\_\_

Device Legends and Notes are listed Appendix C6.1, Field Device Testing-Legend and Notes

[illegible]

\*NOTE: Confirmation of wiring supervision to each individual device is only required during a verification, and is not required at the annual *test*.



**SITE ACCEPTANCE TEST PROCEDURES**

**PERSONAL ALARM LOCATOR SYSTEM  
EDMONTON INSTITUTION  
EDMONTON, ALBERTA**

## **FLARE™ System Acceptance Test**

### **1.0 Purpose**

The PALS System Acceptance Test (PSAT) demonstrates that the system functions correctly and that it meets or exceeds the specifications and contractual requirements. The testing will be witnessed by at least one CSC representative.

Test Date: \_\_\_\_\_

CSC Representative: \_\_\_\_\_

Marcomm Fibre Optics Inc. Representative: \_\_\_\_\_

### **2.0 System Configuration**

Witnessed: \_\_\_\_\_

The system hardware configuration is shown in the “FLARE Hardware Installation Specification.” Confirm that the system is installed as indicated therein.

### **3.0 Minor Self-Test**

Enter the FLARE Diagnostics screen. This screen allows the system administrator to conduct Minor Self-Tests upon demand. Click on the Minor Self-Test icon to initiate the test.

#### **3.1 Minor Self-Test without problems**

Witnessed: \_\_\_\_\_

Observe the operational screen for several minor self-tests and verify that no errors occur.

#### **3.2 Minor Self-Test with problems**

Witnessed: \_\_\_\_\_

Detach one of the PSRUs from the coax backbone. Observe the operational screen for several minor self-tests. First, verify that errors are reported for the PSRU and its PSUs. Re-connect the PSRU and verify that the minor self-test detects that the units are operational again.

### **Major Self-test**

Witnessed: \_\_\_\_\_

Enter the FLARE Diagnostics screen. This screen allows the system administrator to conduct Major Self-Tests upon demand. Click on the Major Self-Test icon to initiate the test and confirm successful operation.

## 5.0 Alarm Location Tests

Witnessed: \_\_\_\_\_

Generate three PPA alarms each at one hundred forty one locations. Record the actual location and the location reported by PALS and displayed on the CMPC.

| Test | Actual Location | Actual P-Zone | Reported in Protection Zone |   |   | # Reports Off by X Zone(s) |   |    | Comments |
|------|-----------------|---------------|-----------------------------|---|---|----------------------------|---|----|----------|
|      |                 |               | 1                           | 2 | 3 | 0                          | 1 | ?2 |          |
| 1    |                 | 1             |                             |   |   |                            |   |    |          |
| 2    |                 | 2             |                             |   |   |                            |   |    |          |
| 3    |                 | 3             |                             |   |   |                            |   |    |          |
| 4    |                 | 4             |                             |   |   |                            |   |    |          |
| 5    |                 | 5             |                             |   |   |                            |   |    |          |
| 6    |                 | 6             |                             |   |   |                            |   |    |          |
| 7    |                 | 7             |                             |   |   |                            |   |    |          |
| 8    |                 | 8             |                             |   |   |                            |   |    |          |
| 9    |                 | 9             |                             |   |   |                            |   |    |          |
| 10   |                 | 10            |                             |   |   |                            |   |    |          |
| 11   |                 | 11            |                             |   |   |                            |   |    |          |
| 12   |                 | 12            |                             |   |   |                            |   |    |          |
| 13   |                 | 13            |                             |   |   |                            |   |    |          |
| 14   |                 | 14            |                             |   |   |                            |   |    |          |
| 15   |                 | 15            |                             |   |   |                            |   |    |          |
| 16   |                 | 16            |                             |   |   |                            |   |    |          |
| 17   |                 | 17            |                             |   |   |                            |   |    |          |
| 18   |                 | 18            |                             |   |   |                            |   |    |          |
| 19   |                 | 19            |                             |   |   |                            |   |    |          |
| 20   |                 | 20            |                             |   |   |                            |   |    |          |
| 21   |                 | 21            |                             |   |   |                            |   |    |          |
| 22   |                 | 22            |                             |   |   |                            |   |    |          |
| 23   |                 | 23            |                             |   |   |                            |   |    |          |
| 24   |                 | 24            |                             |   |   |                            |   |    |          |
| 25   |                 | 25            |                             |   |   |                            |   |    |          |
| 26   |                 | 26            |                             |   |   |                            |   |    |          |
| 27   |                 | 27            |                             |   |   |                            |   |    |          |
| 28   |                 | 28            |                             |   |   |                            |   |    |          |
| 29   |                 | 29            |                             |   |   |                            |   |    |          |
| 30   |                 | 30            |                             |   |   |                            |   |    |          |
| 31   |                 | 31            |                             |   |   |                            |   |    |          |
| 32   |                 | 32            |                             |   |   |                            |   |    |          |
| 33   |                 | 33            |                             |   |   |                            |   |    |          |



## PALS System Acceptance Test

|          |                 |    |   |   |   |  |  |  |   |
|----------|-----------------|----|---|---|---|--|--|--|---|
| 44       |                 | 44 |   |   |   |  |  |  |   |
| 45       |                 | 45 |   |   |   |  |  |  |   |
| 46       |                 | 46 |   |   |   |  |  |  |   |
| 47       |                 | 47 |   |   |   |  |  |  |   |
| TOTAL    | 141 Data Points | NA | X | X | X |  |  |  | Sum in Each Category                            |
| Accuracy | NA              | NA | X | X | X |  |  |  | Calculate % of Test Results with Given Accuracy |

### Pass Criteria - 85% Accuracy

% Accuracy = Total No. of Alarms Reported in Correct Zone / Total No. of Alarms X 100

% Accuracy = Total No. of Alarms Reported in Correct Zone / 141 X 100

### NOTE:

The specified location accuracy of the system is 20 ft.

Test alarm locations within 20 ft. of the edge of a zone should be avoided.

Where necessary, test alarm locations within 20 ft. of the edge of a zone that are shown in the adjacent zone whose edge is within 20 ft. of the test alarm location may be considered to be reported in the correct zone. Verify alarm location from calibration point annunciation.

### 6.0 Operating on battery power

Witnessed: \_\_\_\_\_

Select one PSRU and its PSUs to run on battery power. Disconnect the AC power connection to each unit. Confirm a continuous operating time of four hours on battery power.

On battery power - Starting time: \_\_\_\_\_

Stop time: \_\_\_\_\_

### 6.1 Initial system tests on battery power

Witnessed: \_\_\_\_\_

Run the Minor Self-test and Major Self-test and verify the units on battery power are operating correctly.

### 6.2 System operational for an hour with 20 alarms

Witnessed: \_\_\_\_\_

Verify the system operates normally after one hour while on battery power. Generate 20 alarms during the hour and verify that they are reported correctly.

Starting Time: \_\_\_\_\_  
Stop Time: \_\_\_\_\_

**7.0 Alarm Processing Rate**

Witnessed: \_\_\_\_\_

Generate 10 PPA alarms in 10 seconds using one PPA. Verify that 10 alarms are reported correctly on the CMPC within 10 seconds of the first report. Confirm that alarm transmissions are not too rapid such that the alarm transmitter itself corrupts the transmitted ID. In particular Digilarm™ transmitters can have a corruption problem.

**8.0 Alarm Buffering**

Witnessed: \_\_\_\_\_

Disconnect the serial connection between the CMPC and the MPIU. Generate 20 alarms sequentially using one PPA. Reconnect the CMPC and MPIU serial cable. Verify that all 20 alarms are reported correctly on the CMPC.

**9.0 PPA Decoder Interface/Alarm Filtering**

Witnessed: \_\_\_\_\_

Verify that the CMPC automatically resets the PPA decoder upon receipt of an alarm. Further, verify that alarm transmissions from ID's not registered on the CMPC parameters setup screen are not reported on the CMPC screen.

**10.0 Off-Site Alarms ( Not Applicable for this Site – No Off-Site Alarms )**

Verify that alarm transmissions from ID's registered on the Off-Site screen are reported as originating from off-site zones on the CMPC user screen.

**11.0 Optional Tests**

The Optional Tests are provided at the request of CSC for future maintenance assistance. These tests are not required to be performed as part of the Site Acceptance Procedures as they do no impact on the determination of whether the system operation is acceptable or not. As such any additional test equipment required to perform these tests is to be supplied by CSC.

## 11.1 TTU Output Test

The TTU Output Test may be completed to determine an absolute output signal value of the TTU. The system itself monitors the operating condition of the TTU but it has been suggested by CSC that a recorded absolute signal value may be of use for future maintenance requirements.

To test the TTU signal level, cause the TTU to operate and measure the signal level at a recorded test location with a RF Signal meter set to the transmitted frequency.

**Test Location** \_\_\_\_\_

**Signal Level** \_\_\_\_\_

## 11.2 Test Transmitter Data

The Test Transmitters are to be provided by CSC and be of the same make and model which will be used during normal operation of the system. Prior to the start of the System Acceptance Test a benchmark transmitter signal level may be determined and recorded. At least two Test Transmitters should be used in determining the benchmark signal level. A test calibration point should be configured in the system software and signal readings from three PSUs should be recorded. The three PSUs should be chosen such that no site objects causing major RF attenuation are in line of site from the test calibration point to the PSUs.

To develop the benchmark signal level generate a sample of 10 alarm from each transmitter from the location of the test calibration point with the system in the calibration mode. Verify that the differential in signal levels between the two transmitters does not exceed 20 on the relative signal level scale of 0 to 250. Record each of the signal level readings and average the readings for both transmitters to arrive at the benchmark signal level for each PSU.

**Test Location** \_\_\_\_\_

## Transmitter 1

[illegible]

### Transmitter 2

| Reading | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---------|---|---|---|---|---|---|---|---|---|----|
| PSU 1   | ? | ? | ? | ? | ? | ? | ? | ? | ? | ?  |
| PSU 2   | ? | ? | ? | ? | ? | ? | ? | ? | ? | ?  |
| PSU 3   | ? | ? | ? | ? | ? | ? | ? | ? | ? | ?  |

### Benchmark Signal Level

|       |   |   |   |
|-------|---|---|---|
| PSU 1 | ? | ? | ? |
| PSU 2 | ? | ? | ? |
| PSU 3 | ? | ? | ? |

Any future Transmitters to be used in the system should be tested to ensure the signal level readings at all three PSU are within 20 of the Benchmark Signal Level.

## 12.0 End of Test

In the event of deficiencies, a report of corrective action shall be prepared by Marcomm Fibre Optics Inc. and forwarded to the Technical Authority for approval. Once approval of the corrective actions to be taken is received, the deficiencies will be cleared and re-tested.

At this time the installed PALS System will be considered ready for use and a Site Acceptance Test Report will be produced. The Site Acceptance Test Report will include the following:

1. A copy of the approved Site Acceptance Test Procedures.
2. An equipment list, complete with Serial Numbers where applicable, for all equipment tested.
3. Signed copies of all Test Results Record Sheets.

The Site Acceptance Test Report will be included as part of the system Maintenance Manual.

PALS System Acceptance Test - Successful:  
Conditional Acceptance

|                                  |      |
|----------------------------------|------|
| CSC Representative               | Date |
| CSC Representative               | Date |
| <b>Contractor</b> Representative | Date |

Outstanding Items:

PALS System Acceptance Test - Successful:  
Final Acceptance

|                                  |      |
|----------------------------------|------|
| CSC Representative               | Date |
| CSC Representative               | Date |
| <b>Contractor</b> Representative | Date |

## Appendix A – PALS Zone Designations

Edmonton  
PALS Zones

| Zone | Name  |
|------|---|
| 1    | External Zone 1                                       |
| 2    | External Zone 2                                       |
| 3    | External Zone 3                                       |
| 4    | External Zone 4                                       |
| 5    | External Zone 5                                       |
| 6    | External Zone 6                                       |
| 7    | External Zone 7                                       |
| 8    | External Zone 8                                       |
| 9    | External Courtyard Zone 9                             |
| 10   | External Zone 10                                      |
| 11   | External Zone 11                                      |
| 12   | Gatehouse Main Level                                  |
| 13   | Gatehouse Second Level                                |
| 14   | Private Family Visits Unit 1                          |
| 15   | Private Family Visits Unit 2                          |
| 16   | Sweat Lodge   |
| 17   | S&G Lower Level                                       |
| 18   | S&G Upper Level                                       |
| 19   | Gym Area  |
| 20   | North / West Area - Psychology Area                   |
| 21   | North / West Area - Health Care Centre                |
| 22   | North / West Area - Library and Native<br>Brotherhood |
| 23   | Living Unit A/B - Lower Level                         |
| 24   | Living Unit A/B - Upper Level                         |
| 25   | Living Unit C/D - Lower Level                         |
| 26   | Living Unit C/D - Upper Level                         |
| 27   | Kitchen Area  |
| 28   | Industries Area                                       |
| 29   | South / East Area - Services and Boiler Area          |
| 30   | South / East Area - School Area                       |
| 31   | South / East Area - Institutional Services            |
| 32   | South / East Area - Engineering and Maintenance       |
| 33   | Living Unit E/F - Lower Level                         |
| 34   | Living Unit E/F - Upper Level                         |
| 35   | Living Unit G/H - Lower Level                         |

47      Main Tunnel East Area

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 This Section specifies roles and responsibilities of Commissioning Training.

**1.2 TRAINEES**

- .1 Trainees: Personnel selected for operating and maintaining facility; includes Facility 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.

**1.3 INSTRUCTORS**

- .1 Consultant 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 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 Operation, maintenance, and shut-down of equipment they have certified installation, and carried out functional performance tests.

**1.4 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.



## **1.5 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 Functional Performance Testing Reports.
- .3 Project Manager, 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 Multimedia presentations.
  - .2 Manufacturer's training videos.
  - .3 Equipment models.

## **1.6 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.

## **1.7 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, witnessed by Departmental Representative.

## **1.8 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 Maintenance and servicing.
  - .6 Trouble-shooting diagnosis.
  - .7 Review of O & M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

**1.2 SITE CONDITIONS**

- .1 Notify Departmental Representative before disrupting building services.

**Part 2 Products**

Not used.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Inspect building with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.
- .4 Perform selective demolition to CSA S350.
- .5 Protection of In-Place Conditions:
  - .1 Prevent movement, settlement, or damage to adjacent construction to remain in place. Provide bracing and shoring required.
  - .2 Keep noise, dust, and inconvenience to occupants to minimum.
  - .3 Protect building systems, services and equipment.
  - .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
- .6 Demolition/Removal:
  - .1 Remove items as indicated.
  - .2 Remove parts of existing construction to permit new construction.
  - .3 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.

**3.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning.
  - .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 00 – Cleaning.
- .3 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .4 Waste Management: Remove waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Using Low Risk procedures, remove and dispose of asbestos-containing caulking required for the installation or removal of windows, trim, and surrounds using non-powered hand tools. Control measures to include: Designated work area (banner tape) and polyethylene drop sheets. PPE to include half-face respirators with P100 filters and full-body polyolefin coveralls.
- .2 Furnish labour, materials, services, insurance and equipment, in accordance with requirements of Workplace Health & Safety, Alberta Environment, and other regulatory agencies to complete the work of this section.
- .3 Work will be subject to frequent inspection and air monitoring by the Departmental Representative.
- .4 Refer to attached drawings for locations of asbestos materials to be impacted.
- .5 Confirm site conditions and report discrepancies to the Departmental Representative.

**1.2 REGULATIONS, CODES AND STANDARDS**

- .1 The current issue of the following regulations and guidelines shall govern. Where conflict among these requirements or with these specifications exist, the more stringent requirements shall apply.
  - .1 Canada Occupational Health and Safety Regulation (SOR/86-304).
  - .2 Occupational Health and Safety Act, Regulation and Code.
  - .3 Guidelines for the Disposal of Asbestos Waste.
  - .4 Transportation of Dangerous Goods Regulations.
  - .5 Alberta Asbestos Abatement Manual.
- .2 The current issue of the following codes and standards shall govern. Where conflict among these requirements or with these specifications exist, the more stringent requirements shall apply.
  - .1 CAN/CGSB 1.205-2003, Sealer for Application to Asbestos-Fibre Releasing Materials.
  - .2 CSA Z94.4-18, Selection, Care, and Use of Respirators.
  - .3 CSA S269.2-16, Access Scaffolding for Construction Purposes.

**1.3 DEFINITIONS**

- .1 Abatement: procedures to control fibre release from asbestos-containing materials. Includes encapsulation, repair and removal.
- .2 Air Monitoring: process of measuring fibre content of specific volume of air in stated period of time.

- .3 Airlock: System for permitting ingress and egress without permitting air movement between contaminated area and uncontaminated area, typically consisting of two curtain doorways at least 1800 mm (6 feet) apart.
- .4 Amended Water: water to which a surfactant has been added.
- .5 Authorised Visitor: Includes Departmental Representative, regulatory agency representatives, and other designated personnel.
- .6 Clean Area: uncontaminated area or room that is part of worker decontaminated area, with provisions for storage of workers' street clothes and protective equipment.
- .7 Contaminated: state of materials, surfaces or areas which require cleaning, removal and disposal due to physical contact with asbestos-containing materials or with airborne asbestos fibres,
- .8 Crated: solid self-supporting structure built over equipment or materials of sufficient strength to protect same from damage or contamination for the duration of the work of this section. A 38 mm x 89 mm (2" x 4") timber frame covered with plastic sheeting and hoarded with 10 mm (3/8") plywood is standard of acceptance.
- .9 Critical Barrier: barrier constructed of a 38 mm by 89 mm timber framework, covered on both sides with 6 mil plastic sheeting, taped along free edges and interfaces to prevent movement of airborne asbestos fibre from contaminated work area to adjacent uncontaminated areas. Sheath exposed surfaces in public service areas with plywood. Finish plywood with white, eggshell latex paint.
- .10 Curtain Doorway: Device to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed by placing two overlapping sheets of plastic over existing or temporarily framed doorway, securing each along top of doorway, securing vertical edge of one sheet along one vertical side of doorway, and securing vertical edge of other sheet along opposite vertical side of doorway. Reinforce free edges of polyethylene with duct tape and weight bottom edge to ensure automatic closing.
- .11 Decontamination Enclosure: a series of connected rooms, with curtained doorways between two adjacent rooms, for decontamination of workers or of materials and equipment. A decontamination enclosure system is to contain at least one airlock.
- .12 Encapsulant (Sealant): a liquid material applied to asbestos-containing material to control release of asbestos fibres from material by creating a membrane over the surface (bridging encapsulant) or by penetrating into material and binding its components together (penetrating encapsulant).
- .13 Encapsulation: procedures necessary to coat asbestos-containing materials with encapsulant to control release of asbestos fibres into the ambient air.
- .14 Enclosure: procedures necessary to complete enclosure of asbestos-containing materials within airtight, impermeable barriers.

- .15 Equipment Decontamination Area: decontamination area for materials and equipment, typically consisting of designated area of work area, a wash area, a holding area, and an uncontaminated area.
- .16 Equipment Room: contaminated area or room that is part of the worker decontamination area, with provisions for storage of contaminated clothing and equipment.
- .17 Filter Integrity Test: leak testing using liquid poly-alpha-olefin (PAO) generated into aerosol used for challenging HEPA filter assemblies.
- .18 Fixed Object: a unit of equipment or furniture in the work area which cannot be removed from the work area.
- .19 HEPA Filter: throwaway extended-pleated-medium dry-type filter with:
  - .1 Rigid casing enclosing the full depth of the pleats,
  - .2 Minimum removal efficiency of 99.97% for thermally generated monodisperse DOP smoke particles with a diameter of 0.3 micrometers, and
  - .3 Maximum pressure drop of 1.0 in w.g. when clean and operating at rated airflow capacity.
- .20 Holding Area: chamber between wash area and uncontaminated area in equipment decontamination area. Holding area may comprise an airlock.
- .21 Immediate Vicinity: a four (4) foot area surrounding an asbestos application or either side of a line application or such an area as defined by Departmental Representative.
- .22 Investigative Criteria: the airborne fibre level in fibres per cubic centimetre of air (0.05 f/cc) which corresponds with one half of the Occupational Exposure Limit.
- .23 Maximum Use Concentration: airborne fibre level in fibres per cubic centimetre of air (f/cc) which limits respiratory use in asbestos work environments as outlined in the "Alberta Asbestos Abatement Manual".
- .24 Milestone Inspection: inspection of work area by Departmental Representative at defined point in abatement procedure.
- .25 Moveable Object: unit of equipment or furniture in work area that can be removed from the work area.
- .26 Negative Pressure: Air pressure within work area resulting from air movement equipment established in the area to maintain a minimum pressure differential of 0.50 mm (0.02 inches) of water column relative to adjacent unsealed areas.
- .27 Occupational Exposure Limit (OEL): the airborne fibre level in fibres per cubic centimetre of air (f/cc) to which workers may be repeatedly exposed day after day without adverse effect as specified by Workplace Health & Safety.
- .28 Removal: procedures necessary to strip asbestos-containing materials from designated areas and to dispose of these materials at an acceptable site.
- .29 Repair: procedures necessary to complete containment of asbestos-containing material using materials impermeable to the release of asbestos fibre.

- .30 Surfactant: chemical wetting agent added to water to improve penetration and reduce quantity of water required for a given operation or area.
- .31 Wash Area: an area between work area and holding area in equipment decontamination area. Wash area may comprise an airlock.
- .32 Work Area: Areas where work at risk of increasing airborne fibre is to take place.
- .33 Worker Decontamination Area: decontamination area for workers, typically consisting of a clean area, bucket of clean tepid water, soap, and towels.
- .34 Wet Cleaning: process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water, and afterwards disposing of these cleaning tools as asbestos-contaminated waste.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit proof satisfactory to Departmental Representative that site location, required permits, and arrangements for transport and disposal of asbestos-containing or contaminated materials have been obtained. Ensure required manifest documentation regarding disposal is submitted in accordance with these specifications.
- .3 Submit letters of electrical and mechanical system lock-out.
- .4 Submit documentation verifying Workplace Health & Safety asbestos worker training certification. Submit to the Departmental Representative, documentation of respirator fit tests conducted for all personnel entering the removal site.
- .5 Submit written "Asbestos Project Notification" to Workplace Health & Safety 72 hours prior to the start of the work of this section. Provide 48 hours' notice to Employment and Social Development Canada (ESDC). Provide verbal notification 24 hours prior to beginning work of this section. Provide the Departmental Representative with a copy of the Notification. Submit site-specific work procedures to Departmental Representative.
- .6 Submit manufacturer's information to the Departmental Representative, including test results, material safety data sheets and product specifications, of materials and equipment proposed for use on this project.
- .7 Submit certification or other documentation, acceptable to the Departmental Representative, certifying that air movement and vacuum equipment intended for use on this project have had filter integrity testing. Vacuums must be tested within the last 12 months.
- .8 Prepare and submit work procedures and asbestos control plan.

#### **1.5 QUALITY ASSURANCE**

- .1 Regulatory Requirements: comply with Federal, Provincial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more stringent requirement applies. Comply with regulations in effect at time Work is performed.



- .2 Health and Safety:
  - .1 Perform construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
  - .2 Safety Requirements: worker protection.
    - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:
    - .2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
    - .3 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.
    - .4 Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.
    - .5 Ensure workers wash hands and face when leaving Asbestos Work Area.
    - .6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.
- .3 Removal and handling of asbestos-containing or contaminated materials is to be performed by personnel experienced in methods, procedures, and industry practices of asbestos abatement.
- .4 Ensure that work proceeds to schedule, meeting requirements of this section. Complete the work so that no airborne asbestos, waste or asbestos waste-water runoff contaminate areas adjacent to work areas (building interior or exterior).
- .5 Departmental Representative will inspect for adherence to specified work procedures and materials, and for final cleanliness and completion. Additional labour or materials expended to provide satisfactory performance to the level specified shall be at no additional cost to the Contract.
- .6 Departmental Representative will order a shutdown of work if leakage of asbestos-containing or contaminated materials has occurred or is likely to occur. These conditions include, but are not limited to, failure of negative pressure systems, inadequate wetting, failure of critical barriers or decontamination enclosure systems, water leaks, excessive airborne fibre levels in areas adjacent to the work area or in clean room or holding room areas and the contamination of clean room or holding room areas by asbestos-containing or asbestos-contaminated materials. Additional labour or materials to rectify these or other unsatisfactory conditions shall be at no additional cost to the Contract.

- .7 Inspection and air monitoring services performed as a result of Contractor's failure to conform to specified procedures or level of cleanliness, as determined by the Departmental Representative at the time of a milestone inspection, may be charged to the Contractor at the Departmental Representative's discretion.
- .8 Work of this section involving electrical, mechanical, plumbing, glazing, and other trade work, where applicable, is to be performed by skilled trades regularly engaged in the work in question and under direct supervision of a currently qualified journeyman.
- .9 Provide project supervisor on-site, with authority to oversee all aspects of work of this section including the estimation and negotiation of changes to the contract, submission requirements, scheduling, labour requirements, equipment requirements, and production.
- .10 Provide on-site, for each shift, a shift supervisor outside of the containment, with authority to oversee all aspects of the work of this section related to labour requirements, equipment requirements, and production.
- .11 Replacement of supervisory personnel is not permitted without the written approval of the Departmental Representative.

## **1.6 SITE SUPERVISION**

- .1 During time of hazardous material handling (work at risk of dislodging asbestos-containing material) supervisory personnel are to co-ordinate work and take responsibility for health and safety of personnel working within contaminated areas.
- .2 Employ at least one supervisory person within the enclosure and one outside at all times.
- .3 Submit, for all supervisory personnel, Workplace Health & Safety asbestos worker training certification and documentation substantiating supervisory function on at least two comparable projects in occupied buildings.

## **1.7 SCHEDULING OF WORK**

- .1 Prepare and submit the construction schedule for review by the Departmental Representative minimum five days prior to start of work. Include milestone inspections and other critical events relating to work of this section and work of others. Incorporate Substantial Performance dates, turnover dates respecting related work elsewhere, and time constraints as outlined by Departmental Representative.
- .2 Conduct work of this section in efficient manner, and include phasing work to meet Departmental Representative's schedule.
- .3 Comply with the General Contract and site-specific requirements with regard to working hours, phasing, access restrictions, and operational requirements.
- .4 Allow sufficient time for fibre settling and final air monitoring (minimum 8 hours) following removal.

- .5 Obtain Departmental Representative's acceptance of work area preparation and clean-up.
- .6 Allow sufficient time for inspection of site by Departmental Representative following site preparations and prior to execution of the work of this section.

#### **1.8 WASTE MANAGEMENT AND DISPOSAL**

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .3 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, and Municipal regulations. Dispose of asbestos waste in sealed double thickness 0.15 mm (6 mil) bags or leak proof drums. Label containers with appropriate warning labels.
- .4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

#### **1.9 EXISTING CONDITIONS**

- .1 Reports and information pertaining to ACMs to be handled, removed, or otherwise disturbed and disposed of during this project are bound into this specification at back.
- .2 Notify Departmental Representative of friable material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Departmental Representative.

#### **1.10 BUILDING PROTECTION**

- .1 Ensure building security, prior to leaving facilities, by contacting appropriate security agencies.
- .2 Make good building systems damaged through the work of this section.

#### **1.11 PERSONNEL TRAINING**

- .1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, following minimum requirements:
  - .1 Fitting of equipment.
  - .2 Inspection and maintenance of equipment.
  - .3 Disinfecting of equipment.
  - .4 Limitations of equipment.
- .3 Instruction and training must be provided by a competent, qualified person.

- .4 Supervisory personnel to complete required training.

#### **1.12 AIR MONITORING**

- .1 Engage Environmental Consultant acceptable to the Departmental Representative to perform air monitoring in accordance with NIOSH 7400.
- .2 Assist Environmental Consultant in collection of air samples including provision of workers to wear sampling pumps for up to a full work shift period and provision of adequate, uninterrupted power for low amperage vacuum/pressure type pumps.
- .3 Allow sufficient time for fibre settling and final air monitoring (minimum 8 hours) following each phase of removal.
- .4 Airborne fibre levels found, in excess of “investigative criteria” in areas adjacent to the work area or in clean room or holding room areas, shall initiate an investigation by the Contractor and the Departmental Representative into the source of excess airborne fibre levels.
- .5 Where airborne fibre levels in the work area exceed the Maximum Use Concentration for the respiratory protective equipment observed in use, the Departmental Representative shall take measures outlined in Quality Assurance.
- .6 Conduct air monitoring within the work area to establish acceptable clearance and tear-down conditions following Milestone Inspection B (Visual Clearance Inspection), approval of work area clean-up procedures and the application of a lock-down encapsulant to all surfaces within the work area. Acceptable air clearance criteria have been established by Workplace Health & Safety at less than 0.01 f/cc using aggressive sampling methods.

#### **1.13 INSPECTION**

- .1 The Departmental Representative will periodically inspect site conditions and work procedures inside and outside of the work area.
- .2 The Departmental Representative will perform the following milestone inspections:
  - .1 Milestone Inspection A - Pre-contamination inspection of work area preparation and setup prior to disturbance and removal of asbestos-containing or asbestos-contaminated materials.
  - .2 Milestone Inspection B - Visual clearance inspection of work area following clean-up work procedures but prior to final tear-down procedures.
  - .3 Milestone Inspection C - Air clearance inspection and air monitoring of work area following Milestone Inspection B and the application of a slow drying sealer in the work area but prior to final tear-down procedures.
  - .4 Milestone Inspection D - Dismantling inspection following final tear-down procedures.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Deliver materials and disposable equipment in original packaging, containers, or bundles bearing manufacturer name and brand name. Dispose material that becomes contaminated with asbestos in accordance with applicable regulations.
- .2 Personal Protective Equipment:
  - .1 For Low Risk work, half-face piece, negative pressure, dual-cartridge, P100 filter respirators to be used by all workers.
  - .2 Respirators are to be personally issued and approved by National Institute of Occupational Health and Safety (NIOSH). A review of respiratory protection requirements may be necessary, as dictated by air monitoring results obtained by Departmental Representative.
  - .3 Provide workers, including other sub-trades, with full-body disposable coveralls. Once coveralls are worn in work area, treat as asbestos-contaminated waste and disposed of accordingly. Provide other body protection, including CSA approved safety footwear, required under applicable safety regulations.
    - .1 Standard of acceptance - Full body coveralls with attached hood, manufactured by Dupont Tyvek, Kimberley Clark, X-Guard, or Tychem.
  - .4 Workers are to be clean-shaven to ensure adequate respirator face piece seal. Unshaven workers are not permitted in the work area.
  - .5 Workers are to be fully protected with respirators and protective clothing at all times when the possibility of disturbance of asbestos exists, and when handling bags of asbestos waste.
- .3 Asbestos waste receptors: 0.25 mm minimum thickness labelled polyethylene. Container must be acceptable to disposal site selected and provincial Ministry of Environment.
- .4 Mastic Remover: Blue Bear, BEAN-e-doo mastic remover, Sentinel, Chemsafe, or Mr. Soy.
- .5 Degreaser: Blue Bear Cleaner and Degreaser, or equivalent, Franmar Chemical.
- .6 Plastic sheet: polyethylene, unless otherwise specified, sized to minimize frequency of joints.
  - .1 Floors: Minimum 0.25 mm (10 mil) thick.
  - .2 Walls and ceilings: Minimum 0.15 mm (6 mil) thick.
- .7 Tape: fibreglass-reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.
- .8 Amended water: Water with non-ionic water surfactant added for purpose of reducing surface tension to allow thorough wetting of asbestos fibre.
- .9 Encapsulant: lock-down encapsulant used to seal surfaces post-removal, meeting requirements of CAN/CGSB 1.205.

- .1 Standard of acceptance: Foster Chil-Lock CP240.
- .10 Plywood sheeting: good one side 10 mm (3/8 inch) plywood.
- .11 Reinforced polyethylene: polyethylene or polyolefin materials, coated on each side, with unit weight equivalent to or exceeding 107 g/m<sup>2</sup> (4.6 oz/yd<sup>2</sup>) and 12 mil thick.
- .12 Warning labels and signs: delineating entry and protective equipment requirements and providing warning of the potential health effects of exposure to airborne asbestos fibre.
- .13 Wetting agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether or other product approved by the Departmental Representative mixed with water in concentration to provide total penetration and wetting of asbestos fibre.

## **2.2 TOOLS AND EQUIPMENT**

- .1 Spray equipment for application of amended water or slow drying sealer.
  - .1 Standard of Acceptance: Grayco Hydraspray Airless spray unit.
- .2 HEPA vacuum equipment: appropriate vacuum equipment equipped with High Efficiency Particulate Absolute air filters capable of capturing and retaining 99.97% of all fibrous material 0.3 microns or larger.
- .3 Removal tools: suitable tools for asbestos removal including pliable nylon brushes for the removal of base and finish application.
- .4 Air Movement Equipment: low velocity, high volume centrifugal fan units enclosed in a sealed cabinet incorporating HEPA filter assemblies in their design and manufacture and conforming to specified testing and certification requirements. No air movement equipment shall discharge asbestos fibres outside the work area.
- .5 Temporary Lighting: Grounded halogen light fixtures.
- .6 Temporary Power: 4#8 TECK Feeder Cable and 40 A three (3) pole breaker where required.
- .7 Ground fault electrical panel: temporary service panel NBLP type 100 amp, 120/208 volt, 3 phase wire equipped exclusively with ground fault interrupter circuit.

## **Part 3 Execution**

### **3.1 PREPARATION OF WORK AREA**

- .1 In Low Risk work areas:
  - .1 Isolate the work area from adjacent building areas, using barricades, hazard warning tape or other means as appropriate.
  - .2 Turn-off all HVAC (supply, return, exhaust) serving the work area and seal with polyethylene and tape.

- .3 Provide a worker decontamination area at the entrance to the work area consisting of a bucket of clean tepid water, soap and towels.
- .2 General Preparation Requirements:
  - .1 Low risk personnel protection procedures apply during work area preparation if risk of dislodging asbestos exists.
  - .2 De-energize building electrical systems in work area. Establish lockout or tag-out procedure, as required by Departmental Representative, for de-energization and re-energization of such systems and provide Departmental Representative with required submittals. Identify live electrical lines remaining in work area. Electrical trades to follow low risk work procedures.
  - .3 Isolate building mechanical systems. Shut off exhaust, supply, and return fan units serving work area, and implement required lock-out procedures. Install plastic seals reinforced with tape over all duct openings.
  - .4 Discharge, drain, and cap fire suppression systems where approved by Departmental Representative and authorities having jurisdiction. Where sprinkler systems cannot be drained, cage sprinkler heads to protect from inadvertent damage. Obtain and follow Departmental Representative instructions with regard to foam, carbon dioxide, halogen agent, or dry chemical extinguishing systems.
  - .5 Provide and install temporary lighting to provide one lamp for every 20 square meters of work area.
  - .6 Ensure that holes or openings in existing wall, ceiling, and floor structures are adequately sealed.
  - .7 Remove ceiling, floor, and wall mounted objects and other moveable objects that interfere with asbestos abatement. Clean and store movable objects in areas designated by Departmental Representative or others and protect from re-contamination.
  - .8 Maintain emergency and fire exits from work areas, or establish alternative exits satisfactory to fire officials.
  - .9 Where boilers or hot water tanks or other gas fired appliances must remain in operation, provide ducted source of combustion air to each unit. Ensure that exhaust is effectively sealed in order to prevent back drafting.
  - .10 Seal elevator and other shafts to prevent air leakage from or into these spaces.

### **3.2 ASBESTOS DISTURBANCE AND REMOVAL**

- .1 Wetting and removal of asbestos materials is not to proceed until Milestone Inspection A (pre-contamination inspection) is undertaken by Departmental Representative.
- .2 Interior and Exterior Caulking Removal from Windows and Frames (Low Risk):
  - .1 Using handheld scraper and chemical mastic remover (if required), remove mastic from surface, and place into disposal bags.

- .2 Remove debris materials in work area and dispose as asbestos-contaminated waste.

### **3.3 CLEAN-UP**

- .1 Place asbestos waste and associated debris in sealed asbestos waste receptors. Clean inner bag of gross contamination and place in clean 0.25 mm suitably labelled plastic bag or drum in washroom area of decontamination enclosure system.
- .2 Wet clean or HEPA vacuum, as appropriate, surfaces including but not limited to ceiling suspension systems, wooden ceiling joists, mechanical ducting and vents, domestic piping, electrical conduit and wiring and all horizontal and vertical surfaces within work area.
- .3 Prior to Departmental Representative's visual inspection, supervisory personnel are to perform visual inspection to ensure work has been performed as specified.
- .4 Notify Departmental Representative at suitable stage of final clean-up of requirement for Milestone Inspection B (Visual Clearance Inspection) of work area. Following inspection and acceptance by Departmental Representative, apply coat of slow drying sealer to surfaces in work site including plastic sheeting.

### **3.4 TEAR-DOWN**

- .1 Proceed with final tear-down operations when airborne fibre levels in work area do not exceed acceptable air clearance levels.
- .2 Wet clean or HEPA vacuum entire work area including floor, wall, and curtain doorway surfaces to high standard of cleanliness.
- .3 Tear-down critical barriers, plastic linings, curtain doorways, and air-locks and dispose of as contaminated waste. Remove and dispose asbestos-contaminated materials.
- .4 Dispose of cloths, mops, sponges, rags, nylon brushes, brooms and bristled tools as asbestos waste.
- .5 Wet clean and bag boots and tools before removal from site.
- .6 Clean and seal wood planks and ladders prior to removal from site.
- .7 Final clean-up and dismantling procedures to be undertaken by workers suitably protected with half-face respirators equipped with HEPA filters and disposable coveralls.
- .8 Notify Departmental Representative at suitable stage of final tear-down requirement for 'Milestone Inspection 'D' (Final Tear -Down Inspection) of work area.

### **3.5 DISPOSAL**

- .1 As work progresses, and to prevent exceeding available storage capacity on site, remove sealed and labelled asbestos waste and dispose at authorised disposal area in accordance with requirements of disposal authority.



- .2 Comply with Federal, Provincial, and Municipal authorities regarding transport and disposal of asbestos waste materials.
- .3 Use only dumpsters, lockable bins, or covered vans for disposal of asbestos. Firmly and securely cover bins or dumpsters with tarpaulins and provide with hazardous waste identification placards at all times and prior to transportation.
- .4 Ensure each shipment of containers to landfill is accompanied by Contractor's representative to supervise dumping of containers, to supply equipment operators with appropriate personal protective equipment and to ensure guidelines and regulations are followed. Each load is to require completion and signing of shipping documents.
- .5 Ensure landfill operator is fully aware of hazardous material being disposed of and equipment operators have been fully briefed in management of asbestos containers after delivery to landfill.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Using High Risk procedures, remove and dispose of asbestos-containing vermiculite block insulation, as required for the installation or removal of glazing, trim, and surrounds using powered hand tools. This procedure is to be used when the removal of the window and surrounds is required utilizing power tools where the disturbance of asbestos-containing materials is likely. Control measures to include: Full containment enclosure (interior and exterior), with above ceiling seals, three stage decontamination facility and negative air. PPE to include full-face, PAPR with P100 filters and full-body polyolefin coveralls.
- .2 Furnish labour, materials, services, insurance and equipment, in accordance with requirements of Workplace Health & Safety, Alberta Environment, and other regulatory agencies to complete the work of this section.
- .3 Work will be subject to frequent inspection and air monitoring by the Departmental Representative.
- .4 Refer to attached drawings for locations of asbestos materials to be impacted.
- .5 Confirm site conditions and report discrepancies to the Departmental Representative.

**1.2 REGULATIONS, CODES AND STANDARDS**

- .1 The current issue of the following regulations and guidelines shall govern. Where conflict among these requirements or with these specifications exist, the more stringent requirements shall apply.
  - .1 Canada Occupational Health and Safety Regulation (SOR/86-304).
  - .2 Occupational Health and Safety Act, Regulation and Code.
  - .3 Guidelines for the Disposal of Asbestos Waste.
  - .4 Transportation of Dangerous Goods Regulations.
  - .5 Alberta Asbestos Abatement Manual.
- .2 The current issue of the following codes and standards shall govern. Where conflict among these requirements or with these specifications exist, the more stringent requirements shall apply.
  - .1 CAN/CGSB 1.205-2003, Sealer for Application to Asbestos-Fibre Releasing Materials.
  - .2 CSA Z94.4-18, Selection, Care, and Use of Respirators.
  - .3 CSA S269.2-16, Access Scaffolding for Construction Purposes.

**1.3 DEFINITIONS**

- .1 Abatement: procedures to control fibre release from asbestos-containing materials. Includes encapsulation, repair and removal.

- .2 Air Monitoring: process of measuring fibre content of specific volume of air in stated period of time.
- .3 Airlock: System for permitting ingress and egress without permitting air movement between contaminated area and uncontaminated area, typically consisting of two curtain doorways at least 1800 mm (6 feet) apart.
- .4 Amended Water: water to which a surfactant has been added.
- .5 Authorised Visitor: Includes Departmental Representative, regulatory agency representatives, and other designated personnel.
- .6 Clean Area: uncontaminated area or room that is part of worker decontaminated area, with provisions for storage of workers' street clothes and protective equipment.
- .7 Contaminated: state of materials, surfaces or areas which require cleaning, removal and disposal due to physical contact with asbestos-containing materials or with airborne asbestos fibres,
- .8 Crated: solid self-supporting structure built over equipment or materials of sufficient strength to protect same from damage or contamination for the duration of the work of this section. A 38 mm x 89 mm (2" x 4") timber frame covered with plastic sheeting and hoarded with 10 mm (3/8") plywood is standard of acceptance.
- .9 Critical Barrier: barrier constructed of a 38 mm by 89 mm timber framework, covered on both sides with 6 mil plastic sheeting, taped along free edges and interfaces to prevent movement of airborne asbestos fibre from contaminated work area to adjacent uncontaminated areas. Sheath exposed surfaces in public service areas with plywood. Finish plywood with white, eggshell latex paint.
- .10 Curtain Doorway: Device to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed by placing two overlapping sheets of plastic over existing or temporarily framed doorway, securing each along top of doorway, securing vertical edge of one sheet along one vertical side of doorway, and securing vertical edge of other sheet along opposite vertical side of doorway. Reinforce free edges of polyethylene with duct tape and weight bottom edge to ensure automatic closing.
- .11 Decontamination Enclosure: a series of connected rooms, with curtained doorways between two adjacent rooms, for decontamination of workers or of materials and equipment. A decontamination enclosure system is to contain at least one airlock.
- .12 Encapsulant (Sealant): a liquid material applied to asbestos-containing material to control release of asbestos fibres from material by creating a membrane over the surface (bridging encapsulant) or by penetrating into material and binding its components together (penetrating encapsulant).
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- .18 Fixed Object: a unit of equipment or furniture in the work area which cannot be removed from the work area.
- .19 HEPA Filter: throwaway extended-pleated-medium dry-type filter with:
  - .1 Rigid casing enclosing the full depth of the pleats,
  - .2 Minimum removal efficiency of 99.97% for thermally generated monodisperse DOP smoke particles with a diameter of 0.3 micrometers, and
  - .3 Maximum pressure drop of 1.0 in w.g. when clean and operating at rated airflow capacity.
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- .23 Maximum Use Concentration: airborne fibre level in fibres per cubic centimetre of air (f/cc) which limits respiratory use in asbestos work environments as outlined in the "Alberta Asbestos Abatement Manual".
- .24 Milestone Inspection: inspection of work area by Departmental Representative at defined point in abatement procedure.
- .25 Moveable Object: unit of equipment or furniture in work area that can be removed from the work area.
- .26 Negative Pressure: Air pressure within work area resulting from air movement equipment established in the area to maintain a minimum pressure differential of 0.50 mm (0.02 inches) of water column relative to adjacent unsealed areas.
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#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit proof satisfactory to Departmental Representative that site location, required permits, and arrangements for transport and disposal of asbestos-containing or contaminated materials have been obtained. Ensure required manifest documentation regarding disposal is submitted in accordance with these specifications.
- .3 Submit letters of electrical and mechanical system lock-out.
- .4 Submit documentation verifying Workplace Health & Safety asbestos worker training certification. Submit to the Departmental Representative, documentation of respirator fit tests conducted for all personnel entering the removal site.
- .5 Submit written "Asbestos Project Notification" to Workplace Health & Safety 72 hours prior to the start of the work of this section. Provide 48 hours' notice to Employment and Social Development Canada (ESDC). Provide verbal notification 24 hours prior to beginning work of this section. Provide the Departmental Representative with a copy of the Notification. Submit site-specific work procedures to Departmental Representative.
- .6 Submit manufacturer's information to the Departmental Representative, including test results, material safety data sheets and product specifications, of materials and equipment proposed for use on this project.
- .7 Submit certification or other documentation, acceptable to the Departmental Representative, certifying that air movement and vacuum equipment intended for use on this project have had filter integrity testing. Vacuums must be tested within the last 12 months.
- .8 Prepare and submit work procedures and asbestos control plan.

#### **1.5 QUALITY ASSURANCE**

- .1 Regulatory Requirements: comply with Federal, Provincial and local requirements pertaining to asbestos, provided that in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.

- .2 Health and Safety:
  - .1 Perform construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
  - .2 Safety Requirements: worker and visitor protection.
    - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area includes:
    - .2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
    - .3 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual asbestos abatement.
    - .4 Provide and post in Clean Change Room and in Equipment and Access Room the procedures described in this Section, in both official languages.
    - .5 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.
- .3 Removal and handling of asbestos-containing or contaminated materials is to be performed by personnel experienced in methods, procedures, and industry practices of asbestos abatement.
- .4 Ensure that work proceeds to schedule, meeting requirements of this section. Complete the work so that no airborne asbestos, waste or asbestos waste-water runoff contaminate areas adjacent to work areas (building interior or exterior).
- .5 Departmental Representative will inspect for adherence to specified work procedures and materials, and for final cleanliness and completion. Additional labour or materials expended to provide satisfactory performance to the level specified shall be at no additional cost to the Contract.
- .6 Departmental Representative will order a shutdown of work if leakage of asbestos-containing or contaminated materials has occurred or is likely to occur. These conditions include, but are not limited to, failure of negative pressure systems, inadequate wetting, failure of critical barriers or decontamination enclosure systems, water leaks, excessive airborne fibre levels in areas adjacent to the work area or in clean room or holding room areas and the contamination of clean room or holding room areas by asbestos-containing or asbestos-contaminated materials. Additional labour or materials to rectify these or other unsatisfactory conditions shall be at no additional cost to the Contract.
- .7 Inspection and air monitoring services performed as a result of Contractor's failure to conform to specified procedures or level of cleanliness, as determined by the Departmental Representative at the time of a milestone inspection, may be charged to the Contractor at the Departmental Representative's discretion.
- .8 Work of this section involving electrical, mechanical, plumbing, glazing, and other trade work, where applicable, is to be performed by skilled trades regularly engaged in the work in question and under direct supervision of a currently qualified journeyman.

- .9 Provide project supervisor on-site, with authority to oversee all aspects of work of this section including the estimation and negotiation of changes to the contract, submission requirements, scheduling, labour requirements, equipment requirements, and production.
- .10 Provide on-site, for each shift, a shift supervisor outside of the containment, with authority to oversee all aspects of the work of this section related to labour requirements, equipment requirements, and production.
- .11 Replacement of supervisory personnel is not permitted without the written approval of the Departmental Representative.

#### **1.6 SITE SUPERVISION**

- .1 During time of hazardous material handling (work at risk of dislodging asbestos-containing material) supervisory personnel are to co-ordinate work and take responsibility for health and safety of personnel working within contaminated areas.
- .2 Employ at least one supervisory person within the enclosure and one outside at all times.
- .3 Submit, for all supervisory personnel, Workplace Health & Safety asbestos worker training certification and documentation substantiating supervisory function on at least two comparable projects in occupied buildings.

#### **1.7 SCHEDULING OF WORK**

- .1 Prepare and submit the construction schedule for review by the Departmental Representative minimum five days prior to start of work. Include milestone inspections and other critical events relating to work of this section and work of others. Incorporate Substantial Performance dates, turnover dates respecting related work elsewhere, and time constraints as outlined by Departmental Representative.
- .2 Conduct work of this section in efficient manner, and include phasing work to meet Departmental Representative's schedule.
- .3 Comply with the General Contract and site-specific requirements with regard to working hours, phasing, access restrictions, and operational requirements.
- .4 Allow sufficient time for fibre settling and final air monitoring (minimum 8 hours) following removal.
- .5 Obtain Departmental Representative's acceptance of work area preparation and clean-up.
- .6 Allow sufficient time for inspection of site by Departmental Representative following site preparations and prior to execution of the work of this section.

#### **1.8 WASTE MANAGEMENT AND DISPOSAL**

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

- .3 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, and Municipal regulations. Dispose of asbestos waste in sealed double thickness 0.15 mm (6 mil) bags or leak proof drums. Label containers with appropriate warning labels.
- .4 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

## **1.9 EXISTING CONDITIONS**

- .1 Reports and information pertaining to ACMs to be handled, removed, or otherwise disturbed and disposed of during this project are bound into this specification at back.
- .2 Notify Departmental Representative of suspect asbestos containing material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

## **1.10 SCHEDULING**

- .1 Not later than ten (10) days before beginning Work on this Project, notify following in writing:
  - .1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.
  - .2 Regional Office of Labour Canada.
  - .3 Provincial/Territorial, Department of Labour.
  - .4 Disposal Authority.
- .2 Inform sub-trades of presence of asbestos containing materials identified in Existing Conditions.
- .3 Submit to Departmental Representative copy of notifications prior to start of Work.

## **1.11 BUILDING PROTECTION**

- .1 Provide lockable doors sufficient to ensure work area security in the Clean Room and in the Holding Area of Decontamination Enclosure Systems in High Risk enclosures. Ensure building security at other points of entry to the building, including windows and doors demounted to accommodate installation and exhaust of air movement equipment used through work of this section.
- .2 Ensure building security, prior to leaving facilities, by contacting appropriate security agencies.
- .3 Make good building systems damaged through the work of this section.

## **1.12 PERSONNEL TRAINING**

- .1 Before beginning Work, provide to Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene including dress and showers, in entry and exit



from Asbestos Work Area, in aspects of work procedures including glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.

- .2 Instruction and training related to respirators includes, at minimum:
  - .1 Proper fitting of equipment.
  - .2 Inspection and maintenance of equipment.
  - .3 Disinfecting of equipment.
  - .4 Limitations of equipment.
- .3 Instruction and training must be provided by competent, qualified person.
- .4 Supervisory personnel to complete required training.

### **1.13 AIR MONITORING**

- .1 Engage Environmental Consultant acceptable to the Departmental Representative to perform air monitoring in accordance with NIOSH 7400.
- .2 Assist Environmental Consultant in collection of air samples including provision of workers to wear sampling pumps for up to a full work shift period and provision of adequate, uninterrupted power for low amperage vacuum/pressure type pumps.
- .3 Allow sufficient time for fibre settling and final air monitoring (minimum 8 hours) following each phase of removal.
- .4 Airborne fibre levels found, in excess of “investigative criteria” in areas adjacent to the work area or in clean room or holding room areas, shall initiate an investigation by the Contractor and the Departmental Representative into the source of excess airborne fibre levels.
- .5 Where airborne fibre levels in the work area exceed the Maximum Use Concentration for the respiratory protective equipment observed in use, the Departmental Representative shall take measures outlined in Quality Assurance.
- .6 Conduct air monitoring within the work area to establish acceptable clearance and tear-down conditions following Milestone Inspection B (Visual Clearance Inspection), approval of work area clean-up procedures and the application of a lock-down encapsulant to all surfaces within the work area. Acceptable air clearance criteria have been established by Workplace Health & Safety at less than 0.01 f/cc using aggressive sampling methods.

### **1.14 INSPECTION**

- .1 The Departmental Representative will periodically inspect site conditions and work procedures inside and outside of the work area.
- .2 The Departmental Representative will perform the following milestone inspections:
  - .1 Milestone Inspection A - Pre-contamination inspection of work area preparation and setup prior to disturbance and removal of asbestos-containing or asbestos-contaminated materials.

- .2 Milestone Inspection B - Visual clearance inspection of work area following clean-up work procedures but prior to final tear-down procedures.
- .3 Milestone Inspection C - Air clearance inspection and air monitoring of work area following Milestone Inspection B and the application of a slow drying sealer in the work area but prior to final tear-down procedures.
- .4 Milestone Inspection D - Dismantling inspection following final tear-down procedures.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Deliver materials and disposable equipment in original packaging, containers, or bundles bearing manufacturer name and brand name. Dispose material that becomes contaminated with asbestos in accordance with applicable regulations.
- .2 Personal Protective Equipment:
  - .1 For Low Risk work, half-face piece, negative pressure, dual-cartridge, P100 filter respirators to be used by all workers.
  - .2 Respirators are to be personally issued and approved by National Institute of Occupational Health and Safety (NIOSH). A review of respiratory protection requirements may be necessary, as dictated by air monitoring results obtained by Departmental Representative.
  - .3 Provide workers, including other sub-trades, with full-body disposable coveralls. Once coveralls are worn in work area, treat as asbestos-contaminated waste and disposed of accordingly. Provide other body protection, including CSA approved safety footwear, required under applicable safety regulations.
    - .1 Standard of acceptance - Full body coveralls with attached hood, manufactured by Dupont Tyvek, Kimberley Clark, X-Guard, or Tychem.
  - .4 Workers are to be clean-shaven to ensure adequate respirator face piece seal. Unshaven workers are not permitted in the work area.
  - .5 Workers are to be fully protected with respirators and protective clothing at all times when the possibility of disturbance of asbestos exists, and when handling bags of asbestos waste.
- .3 Asbestos waste receptors: 0.25 mm minimum thickness labelled polyethylene. Container must be acceptable to disposal site selected and provincial Ministry of Environment.
- .4 Amended water: Water with non-ionic water surfactant added for purpose of reducing surface tension to allow thorough wetting of asbestos fibre.
- .5 Degreaser: Blue Bear Cleaner and Degreaser, or equivalent, Franmar Chemical.

- .6 Deliver materials and disposable equipment in original packaging, containers, or bundles bearing manufacturer name and brand name. Dispose material that becomes contaminated with asbestos in accordance with applicable regulations.
- .7 Disposable coveralls: Standard of acceptance - Full body coveralls with attached hood, manufactured by Dupont Tyvek, Kimberley Clark, X-Guard, or Tychem.
- .8 Duct Tape: Suitable for sealing polyethylene to surfaces encountered and to itself under wet and dry conditions including use of amended water.
- .9 Encapsulant: lock-down encapsulant used to seal surfaces post-removal, meeting requirements of CAN/CGSB 1.205.
  - .1 Standard of acceptance: Foster Chil-Lock CP240.
- .10 Mastic Remover: Blue Bear BEAN-e-doo mastic remover, Sentinel, Chemsafe, or Mr. Soy.
- .11 Plastic sheet: polyethylene, unless otherwise specified, sized to minimize frequency of joints.
  - .1 Floors: Minimum 0.25 mm (10 mil) thick.
  - .2 Walls and ceilings: Minimum 0.15 mm (6 mil) thick.
- .12 Plywood sheeting: good one side 10 mm (3/8 inch) plywood.
- .13 Reinforced polyethylene: polyethylene or polyolefin materials, coated on each side, with unit weight equivalent to or exceeding 107 g/m<sup>2</sup> (4.6 oz/yd<sup>2</sup>) and 12 mil thick.
- .14 Warning labels and signs: delineating entry and protective equipment requirements and providing warning of the potential health effects of exposure to airborne asbestos fibre.
- .15 Wetting agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether or other product approved by the Departmental Representative mixed with water in concentration to provide total penetration and wetting of asbestos fibre.

## **2.2 TOOLS AND EQUIPMENT**

- .1 Spray equipment for application of amended water or slow drying sealer.
  - .1 Standard of Acceptance: Grayco Hydraspray Airless spray unit.
- .2 HEPA vacuum equipment: appropriate vacuum equipment equipped with High Efficiency Particulate Absolute air filters capable of capturing and retaining 99.97% of all fibrous material 0.3 microns or larger.
- .3 Removal tools: suitable tools for asbestos removal including pliable nylon brushes for the removal of base and finish application.
- .4 Air Movement Equipment: low velocity, high volume centrifugal fan units enclosed in a sealed cabinet incorporating HEPA filter assemblies in their design and manufacture and conforming to specified testing and certification requirements. No air movement equipment shall discharge asbestos fibres outside the work area.

- .5 Temporary Lighting: Grounded halogen light fixtures.
- .6 Temporary Power: 4#8 TECK Feeder Cable and 40 A three (3) pole breaker where required.
- .7 Ground fault electrical panel: temporary service panel NBLP type 100 amp, 120/208 volt, 3 phase wire equipped exclusively with ground fault interrupter circuit.

### **Part 3 Execution**

#### **3.1 PREPARATION OF WORK AREA**

- .1 In High Risk work areas:
  - .1 Establish critical barriers at all points of entry to the work area.
  - .2 Provide a layer of reinforced polyethylene on the floor of the containment covered by a second layer of at least 6 mil polyethylene sheeting. Lay the floor linings in continuous sheets extending 300 mm (12 inches) up the walls and seal in place along all free edges. Bond floor linings with two-sided adhesive tape to prevent lifting.
  - .3 Line finished walls and critical barriers with 0.15 mm (6 mil) plastic sheet and seal with duct tape. Overlap floor linings with wall linings and seal in place along all free edges.
  - .4 Ensure plastic linings provide continuous barrier and that seal is maintained around penetrating objects, tears, and elsewhere as required by Departmental Representative.
  - .5 Remove perimeter ceiling tiles outside of work area perimeter and install above ceiling critical barriers.
  - .6 Crate over and protect fixed objects in the removal area from damage.
  - .7 Using HEPA filtered negative air cabinets, establish and maintain 0.02 inches negative pressure. Perform one air change every 15 minutes. Ensure negative pressure requirements are maintained relative to pressures maintained in existing mechanical systems. Extend exhaust ducting from air movement equipment installed in work area to outside of building to areas acceptable to Departmental Representative. Continuously operate air movement equipment from time of initial asbestos disturbance until acceptance of clean-up procedures by Departmental Representative, or as directed by the Departmental Representative.
  - .8 Remove windows, using qualified trades, to allow exhaust of air movement equipment. Install plywood panels to maintain building security.
- .2 General Preparation Requirements:
  - .1 Low risk personnel protection procedures apply during work area preparation if risk of dislodging asbestos exists.

- .2 De-energize building electrical systems in work area. Establish lockout or tag-out procedure, as required by Departmental Representative, for de-energization and re-energization of such systems and provide Departmental Representative with required submittals. Identify live electrical lines remaining in work area. Electrical trades to follow low risk work procedures.
- .3 Isolate building mechanical systems. Shut off exhaust, supply, and return fan units serving work area, and implement required lock-out procedures. Install plastic seals reinforced with tape over all duct openings.
- .4 Discharge, drain, and cap fire suppression systems where approved by Departmental Representative and authorities having jurisdiction. Where sprinkler systems cannot be drained, cage sprinkler heads to protect from inadvertent damage. Obtain and follow Departmental Representative instructions with regard to foam, carbon dioxide, halogen agent, or dry chemical extinguishing systems.
- .5 Provide and install temporary lighting to provide one lamp for every 20 square meters of work area.
- .6 Ensure that holes or openings in existing wall, ceiling, and floor structures are adequately sealed.
- .7 Remove ceiling, floor, and wall mounted objects and other moveable objects that interfere with asbestos abatement. Clean and store movable objects in areas designated by Departmental Representative or others and protect from re-contamination.
- .8 Maintain emergency and fire exits from work areas, or establish alternative exits satisfactory to fire officials.
- .9 Where boilers or hot water tanks or other gas fired appliances must remain in operation, provide ducted source of combustion air to each unit. Ensure that exhaust is effectively sealed in order to prevent back drafting.
- .10 Seal elevator and other shafts to prevent air leakage from or into these spaces.

### **3.2 DECONTAMINATION ENCLOSURES**

- .1 Two-Stage Worker Decontamination Unit
  - .1 Construct Worker Decontamination Enclosures in locations acceptable to Departmental Representative.
  - .2 Locate switch for temporary lighting inside clean room.
  - .3 Locate work area water supply shutoff inside clean room.
  - .4 Build equipment and access room contiguous with work area, with two curtain doorways, to clean room and to work area.
  - .5 Build clean room between equipment and access room and clean areas outside of enclosures, with one curtain doorway leading to equipment and access room. Provide lockers or hangers for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install mirror to permit workers to fit respiratory

equipment properly. Provide one clean towel per worker per decontamination for all workers on site.

- .2 Three-Stage Worker Decontamination Unit
  - .1 Construct Worker Decontamination Enclosures in locations acceptable to Departmental Representative.
  - .2 Locate switch for temporary lighting inside clean room.
  - .3 Locate work area water supply shutoff inside clean room.
  - .4 Build equipment and access room between shower room and contiguous with work area, with two curtain doorways, to shower room and to work area.
  - .5 Build shower room between clean room and equipment and access room, with two curtain doorways, one to clean room and one to equipment and access room. Shower rooms to be walk through type, ensure entry and exit through actual showers by opposing doors, such that access to clean room from shower room must be through actual showers. Provide hot and cold water supply in each work area and minimum of two shower heads, self-activating pump for disposal of waste water, and leak proof connections to water supply.
  - .6 Build clean room between shower room and clean areas outside of enclosures, with one curtain doorway leading to shower room and second lockable door to outside of enclosures. Provide lockers or hangers for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install mirror to permit workers to fit respiratory equipment properly. Provide one clean towel per worker per decontamination for all workers on site.
- .3 Waste Transfer Enclosure
  - .1 Build container cleaning room between staging area and holding room with two doorways, one to staging area and one to holding room. Room shall be built of sufficient size to allow proper washing of equipment and drums and/or double bagging of asbestos waste. Treat wash water as asbestos contaminated waste.
  - .2 Build holding room between washroom and uncontaminated area, with two curtain doorways, one to washroom and one to uncontaminated area, and lockable door to outside of enclosures. Construct holding room of sufficient size to accommodate largest item of equipment used and all waste containers.
- .4 General Requirements for Decontamination Enclosures
  - .1 Construction to be of quality and design to assure against leakage of asbestos fibres and water to areas outside scope of work.
  - .2 Build curtain doorways designed so when workers or drums and equipment move through doorway, one of two barriers comprising doorways always remains closed.
  - .3 Provide lockable doors at entrances to clean room and holding room of the decontamination enclosure systems.

- .4 Maintain enclosures in clean and tidy condition.
- .5 Visually inspect enclosures regularly and at the beginning of each working period. Repair damaged barriers and remedy defects immediately upon discovery.

### **3.3 ASBESTOS DISTURBANCE AND REMOVAL**

- .1 Wetting and removal of asbestos materials is not to proceed until Milestone Inspection A (pre-contamination inspection) is undertaken by Departmental Representative.
- .2 Vermiculite block insulation removal from concrete blocks (High Risk Removal)
  - .1 Remove vermiculite insulation, dust and debris under full containment procedures.
  - .2 Personnel within work area are to wear disposable coveralls made of material that resists penetration by asbestos fibres and a Powered Air Purifying Respirator (PAPR), or better, equipped with P100 filters.
  - .3 Seal penetrations to prevent vermiculite insulation release.
  - .4 Perform bulk removal by HEPA-filtered vacuum truck, or by hand-shoveling insulation into asbestos disposal containers. If hand shoveling, use amended water to mist removal area as insulation is being removed (to reduce fibre and dust levels).
  - .5 Removal of vermiculite insulation within concrete block walls: Tape asbestos waste bag to wall to catch material as it drains. Create hole in concrete block wall. As insulation drains into the bag, wet down waste in the bag.
  - .6 After bulk removal is completed, remove residual vermiculite insulation and dust by wet cleaning thoroughly with amended water and HEPA vacuuming using portable vacuum machines.
  - .7 Ensure that no vermiculite insulation debris and dust remain on surfaces.
  - .8 Wet isolation barriers, fold toward inside, sides facing work area. Prepare for disposal and dispose as asbestos-contaminated waste.
  - .9 Have Environmental Consultant complete air monitoring in removal area and visual inspection prior to acceptance of the work.

### **3.4 CLEAN-UP**

- .1 Place asbestos waste and associated debris in sealed asbestos waste receptors. Clean inner bag of gross contamination and place in clean 0.25 mm suitably labelled plastic bag or drum in washroom area of decontamination enclosure system.
- .2 Wet clean or HEPA vacuum, as appropriate, surfaces including but not limited to ceiling suspension systems, wooded ceiling joists, mechanical ducting and vents, domestic piping, electrical conduit and wiring and all horizontal and vertical surfaces within work area.
- .3 Prior to Departmental Representative's visual inspection, supervisory personnel are to perform visual inspection to ensure work has been performed as specified.

- .4 Notify Departmental Representative at suitable stage of final clean-up of requirement for Milestone Inspection B (Visual Clearance Inspection) of work area. Following inspection and acceptance by Departmental Representative, apply coat of slow drying sealer to surfaces in work site including plastic sheeting.
- .5 Keep HEPA filtered negative air pressure systems, air filtration, and decontamination enclosure systems in service at this time.
- .6 Allow minimum 8 hours for fibre settling after High Risk work with no disturbance of work site before air clearance monitoring. Notify Departmental Representative of requirement for Milestone Inspection C (Air Clearance Inspection).

### **3.5 TEAR-DOWN**

- .1 Proceed with final tear-down operations when airborne fibre levels in work area do not exceed acceptable air clearance levels.
- .2 Wet clean or HEPA vacuum entire work area including floor, wall, and curtain doorway surfaces to high standard of cleanliness.
- .3 Tear-down critical barriers, plastic linings, curtain doorways, and air-locks and dispose of as contaminated waste. Remove and dispose asbestos-contaminated materials.
- .4 Dispose of cloths, mops, sponges, rags, nylon brushes, brooms and bristled tools as asbestos waste.
- .5 Wet clean and bag boots and tools before removal from site.
- .6 Clean and seal wood planks and ladders prior to removal from site.
- .7 Final clean-up and dismantling procedures to be undertaken by workers suitably protected with half-face respirators equipped with HEPA filters and disposable coveralls.
- .8 Notify Departmental Representative at suitable stage of final tear-down requirement for 'Milestone Inspection 'D' (Final Tear -Down Inspection) of work area.

### **3.6 DISPOSAL**

- .1 As work progresses, and to prevent exceeding available storage capacity on site, remove sealed and labelled asbestos waste and dispose at authorised disposal area in accordance with requirements of disposal authority.
- .2 Comply with Federal, Provincial, and Municipal authorities regarding transport and disposal of asbestos waste materials.
- .3 Use only dumpsters, lockable bins, or covered vans for disposal of asbestos. Firmly and securely cover bins or dumpsters with tarpaulins and provide with hazardous waste identification placards at all times and prior to transportation.
- .4 Ensure each shipment of containers to landfill is accompanied by Contractor's representative to supervise dumping of containers, to supply equipment operators with appropriate personal protective equipment and to ensure



guidelines and regulations are followed. Each load is to require completion and signing of shipping documents.

- .5 Ensure landfill operator is fully aware of hazardous material being disposed of and equipment operators have been fully briefed in management of asbestos containers after delivery to landfill.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Comply with requirements of this Section when performing following Work:
  - .1 Removal of painted fasteners from windows, surrounds, security bars, trim, framing, sills, drywall, plaster, masonry, wood covers, etc. using a power tool with an effective dust collection system equipped with a HEPA filter, or a non-powered hand tool. Control measures to include: Designated work area (banner tape) and polyethylene drop sheets. Personal Protection Equipment (PPE) to include half-face respirators with P100 filters, nitrile gloves, and full-body polyolefin coveralls.
  - .2 Application of fasteners into painted windows, surrounds, security bars, trim, framing, sills, drywall, plaster, masonry, wood covers, etc. using a power tool with an effective dust collection system equipped with a HEPA filter, or a non-powered hand tool. Control measures to include: Designated work area (banner tape) and polyethylene drop sheets. Personal Protection Equipment (PPE) to include half-face respirators with P100 filters, nitrile gloves, and full-body polyolefin coveralls.
  - .3 Removal of paint from windows, surrounds, security bars, trim, framing, sills, drywall, plaster, masonry, wood covers, etc., using a chemical gel or paste. This procedure is to be used prior to cutting through the painted materials with power tools. Control measures to include: Designated work area (banner tape) and polyethylene drop sheets. Personal Protection Equipment (PPE) to include half-face respirators with P100 filters, goggles, nitrile gloves, and full-body polyolefin coveralls.
  - .4 Removal of paint from windows, surrounds, security bars, trim, framing, sills, drywall, plaster, masonry, wood covers, etc., using scrapers and hand tools. This procedure is to be used in order to prepare windows, bars, surrounds, etc. to be repainted. Control measures to include: Designated work area (banner tape) and polyethylene drop sheets. Personal Protection Equipment (PPE) to include half-face respirators with P100 filters, goggles, nitrile gloves, and full-body polyolefin coveralls.
  - .5 Removal and disposal of painted windows, surrounds, security bars, trim, framing, sills, drywall, plaster, masonry, wood covers, etc. using general demolition. This procedure is to be used for disposal of painted materials not to be reused as part of this project. Control measures to include: Designated work area (banner tape) and polyethylene drop sheets. Personal Protection Equipment (PPE) to include half-face respirators with P100 filters, goggles, nitrile gloves, and full-body Tyvek coveralls.

**1.2 REFERENCE STANDARDS**

- .1 Department of Justice Canada
  - .1 Canadian Environmental Protection Act, 1999 (CEPA).
  - .2 Surface Coating Materials Regulations, SOR/2005-109, Hazardous Products Act.

- .2 Alberta Government
  - .1 Occupational Health and Safety Act, Regulation and Code, Province of Alberta.
  - .2 Occupational Health and Safety Bulletin, Lead at the Work Site (CH071), Government of Alberta, November 2013.
- .3 Canadian Standards Association (CSA)
  - .1 CSA Z94.4-18, Selection, Care, and Use of Respirators.
- .4 Health Canada
  - .1 Workplace Hazardous Materials Information System (WHMIS), Material Safety Data Sheets (MSDS).
- .5 Human Resources and Social Development Canada (HRSDC)
  - .1 Canada Labour Code Part II, - SOR 86-304 - Occupational Health and Safety Regulations.
- .6 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .7 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH).
  - .1 NIOSH 94-113 - NIOSH Manual of Analytical Methods (NMAM), 4th Edition (1994).
- .8 U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances
  - .1 Lead in Construction Regulation - 29 CFR 1926.62-1993.
- .9 U.S. Environmental Protection Agency (EPA)
  - .1 EPA 747-R-95-007-1995, Sampling House Dust for Lead.
- .10 Underwriters' Laboratories of Canada (ULC)

### **1.3 DEFINITIONS**

- .1 Action Level: Employee exposure, without regard to use of respirators, to airborne concentration of lead of 50 micrograms per cubic meter of air ( $50 \mu\text{g}/\text{m}^3$ ) calculated as 8-hour time-weighted average (TWA). Minimum precautions for lead abatement are based on airborne lead concentrations less than 0.05 milligrams per cubic meter ( $0.05 \text{ mg}/\text{m}^3$ ) of air for removal of lead-based paint.
- .2 Authorised Visitor: Departmental Representative, persons representing regulatory agencies, and other personnel as designated by Departmental Representative.
- .3 Competent person: Personnel capable of identifying existing lead hazards in workplace taking corrective measures to eliminate them.
- .4 Enclosure: Rip-proof polyethylene sheeting installed to fully isolate the Lead Work Area. Enclosure shall have polyethylene sheeting as a top at locations where the enclosure does not extend up to the underside of the structure.

- .5 Filter Integrity Test: Leak testing using liquid dioctylphthalate (DOP) or polyalphaolefin (PAO) generated into an aerosol used for challenging HEPA filter assemblies.
- .6 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .7 Lead dust: wipe sampling on vertical surfaces and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of lead in dust per square foot.
- .8 Lead Work Area: Area where work takes place which will, or may, disturb lead paint.
- .9 Occupied Area: Areas of building or work site that is outside Work Area.
- .10 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects over cuts and tears, and elsewhere as required to provide protection and isolation. For protection of underlying surfaces from damage and to prevent lead dust entering in clean area.
- .11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must be appropriate capacity for scope of work.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of lead-based paint waste in accordance with requirements of authority having jurisdiction.
- .3 Exposure control plan:
  - .1 Develop and provide an Exposure Control Plan to deal with dust and fumes generated by the project. Include:
    - .1 Statement of purpose and responsibilities.
    - .2 Worker education about the hazards of lead and safe work procedures.
    - .3 Written safe work procedures to control exposure.
    - .4 Health monitoring.
    - .5 Documentation and record keeping.
    - .6 Follow up procedures to evaluate how well the program is working and determine if changes are required.
  - .2 Refer to Alberta Government handbook Lead at the Work Site.
- .4 Quality Control:
  - .1 Provide Departmental Representative necessary permits for transportation and disposal of lead based paint waste and proof that lead-based paint waste has been received and properly disposed.

- .2 Provide proof satisfactory to Departmental Representative that employees have had instruction on hazards of lead exposure, respirator use, dress, and aspects of work procedures and protective measures.

## **1.5 QUALITY ASSURANCE**

- .1 Regulatory Requirements: comply with Federal, Provincial, and local requirements pertaining to lead paint, provided that in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.
- .2 Ensure that removal and handling of lead-contaminated materials is performed by personnel experienced in methods, procedures, and industry practices of lead abatement.
- .3 Health and Safety:
  - .1 Perform construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Dispose of lead-painted materials as hazardous waste unless a Toxicity Characterization Leaching Procedure (TCLP) test shows no lead content.
- .2 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
- .3 Remove waste materials in accordance with Departmental Representative's requirements while following applicable transport and waste disposal regulations.
- .4 Disposal of lead waste generated by removal activities must comply with Federal, Provincial, and Municipal regulations. Dispose of lead waste in sealed double thickness 0.15 mm (6 mil) bags or leak proof drums. Label containers with appropriate warning labels.
- .5 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

## **1.7 EXISTING CONDITIONS**

- .1 Reports and information pertaining to lead-based paint to be handled, removed, or otherwise disturbed and disposed of during this Project are attached to this specification.
- .2 Refer to Drawings for locations of lead-based paints to be impacted.
- .3 Notify Departmental Representative of lead-based paint discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

## **1.8 SCHEDULING**

- .1 Not later than two days before beginning Work on this Project notify following in writing:

- .1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.
- .2 Provincial Ministry of Labour.
- .3 Disposal Authority.
- .2 Inform sub trades of presence of lead-containing materials identified in Existing Conditions.
- .3 Provide Departmental Representative copy of notifications prior to start of Work.
- .4 Conduct work of this section in efficient manner, and include phasing work to meet Departmental Representative's schedule.

## **1.9 PERSONNEL TRAINING**

- .1 Provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of lead exposure, in personal hygiene, in aspects of work procedures, [and in use, cleaning, and disposal of respirators].
- .2 Instruction and training related to respirators includes, at minimum:
  - .1 Proper fitting of equipment.
  - .2 Inspection and maintenance of equipment.
  - .3 Disinfecting of equipment.
  - .4 Limitations of equipment.
- .3 Instruction and training must be provided by competent, qualified person.
- .4 Supervisory personnel to complete required training.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Polyethylene: 0.15 mm (6 mil) thick unless otherwise specified; in sheet size to minimize joints.
- .2 Polyethylene disposal bags, 0.15 mm (6 mil) thick.
- .3 Tape: fibreglass-reinforced duct tape suitable for sealing polyethylene under dry conditions and wet conditions using amended water.
- .4 Slow-drying sealer: non-staining, clear, water-dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual lead paint residue.
- .5 Lead waste containers: metal or fibre type acceptable to dump operator with tightly fitting covers and 0.15 mm (6 mil) thickness sealable polyethylene liners.
  - .1 Label containers with pre-printed cautionary "Warning: Lead" clearly visible when ready for removal to disposal site.

**Part 3        Execution**

**3.1        SUPERVISION**

- .1        One Supervisor for every ten workers is required.
- .2        Supervisor must remain within work area during disturbance, removal, or handling of lead based paints.

**3.2        PREPARATION**

- .1        Remove and store items to be salvaged or reused.
  - .1        Protect and wrap items and transport and store in area specified by Departmental Representative.
- .2        Provide warning signs at the entrances to the lead control area which state:
  - .1        Lead hazard area.
  - .2        Access to area is prohibited except to authorized personnel.
  - .3        Personal protective equipment is required.
  - .4        Drinking, eating, and smoking are prohibited in the area.
- .3        Work Area:
  - .1        Shut off and isolate HVAC system to prevent dust dispersal into other building areas.
  - .2        Pre-clean fixed casework and equipment within work area, using HEPA vacuum and cover and seal with polyethylene sheeting and tape.
  - .3        Clean work area using HEPA vacuum. If not practicable, use wet cleaning method. Do not raise dust.
  - .4        Seal off openings with polyethylene sheeting and seal with tape.
  - .5        Protect floor surfaces covered from wall to wall with polyethylene sheets.
  - .6        Maintain emergency fire exits or establish alternatives satisfactory to Authority having jurisdiction.
  - .7        Where water application is required for wetting lead-containing materials, provide temporary water supply appropriately sized for application of water as required.
  - .8        Provide electrical power and shut off for operation of powered tools and equipment. Provide 24 volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical cables and equipment.
- .4        Do not start work until:
  - .1        Arrangements have been made for disposal of waste.
  - .2        Tools, equipment, and materials waste containers are on site.
  - .3        Arrangements have been made for building security.
  - .4        Notifications have been completed and preparatory steps have been taken.

### **3.3 LEAD ABATEMENT**

- .1 Fastener Application and Removal from Window/Surrounds/Trim/Sills/Drywall/Plaster/Etc.
  - .1 Mist surfaces with water to reduce particulate levels.
  - .2 Place nozzle of HEPA vacuum immediately below fastener to be installed or removed.
  - .3 Install or remove fasteners from surfaces impacting lead-containing coatings with power tools equipped with HEPA filters; or with non-powered hand tool, other than manual scraping and sanding.
  - .4 HEPA vacuum debris and apply lead-encapsulating sealer to surfaces where lead-based paint have been impacted or debris settled.
  - .5 Remove debris materials in work area and dispose as lead-contaminated waste.
- .2 Disturbance of Lead-Based Paints Using a Chemical or Gel Paste:
  - .1 Remove lead-containing coatings anticipated to be impacted by window replacement, specifically on windows, sills and trim to be preserved and/or refinished, and on security bars to be cut-out and refinished, with a chemical or gel paste.
  - .2 Remove lead-based paint in small sections, extending at least one centimeter on either side of any intended cut point.
  - .3 Place removed paint and debris in sealable 0.15 mm (6 mil) plastic bags and dispose in labelled containers for transport.
  - .4 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to staging area. Clean external surfaces thoroughly again by wet sponging. Wash containers thoroughly pending removal to outside. Ensure containers are removed by workers who have entered from uncontaminated areas dressed in clean coveralls.
  - .5 After completion of stripping work, wire brush and wet wipe all surfaces in the work area. During this work keep surfaces wet.
  - .6 Remove debris materials in work area and dispose as lead-contaminated waste.
  - .7 Apply lead encapsulating sealer to surfaces within work area, and equipment used in process. After inspection and acceptance by Departmental Representative, work area may be turned over to unprotected workers.
- .3 Window Removal Using General Demolition:
  - .1 Mist surfaces with water to reduce particulate levels.
  - .2 Remove fasteners as per the Low Risk procedures above.
  - .3 Remove window, surround, buck, sash, sill, stops, trim, etc., as required, using hand tools, being careful not to disturb drywall, plaster, and mortar.
  - .4 Clean and dispose of non-painted surfaces as general waste.
  - .5 Clean and recycle painted metal surfaces.



- .6 Dispose of painted porous materials (drywall, plaster, wood, etc.) as lead waste unless TCLP testing shows no lead content.
- .7 HEPA vacuum and remove debris materials in the work area, including within the window cavity, and dispose as lead-contaminated waste.

### **3.4 INSPECTION**

- .1 Perform inspection to confirm compliance with specification and governing authority requirements. Deviations from these requirements not approved in writing by Departmental Representative will result in work stoppage, at no cost to Owner.
- .2 Departmental Representative will inspect work for:
  - .1 Adherence to specific procedures and materials.
  - .2 Final cleanliness and completion.
  - .3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

### **3.5 FINAL CLEANUP**

- .1 When Departmental Representative inspected and accepted for final cleanliness in work area, proceed with final cleanup.
- .2 Remove polyethylene sheet by rolling it away from walls to center of work area. Vacuum visible lead containing particles observed during cleanup, immediately, using HEPA vacuum.
- .3 Place polyethylene sheets, tape, cleaning material, clothing, and contaminated waste in plastic bags and sealed labelled waste containers for transport.
- .4 Conduct final check to ensure no dust or debris remains on surfaces as result of dismantling operations.

### **3.6 TRANSPORTATION AND PERMANENT DISPOSAL**

- .1 Transport waste lead waste in accordance with Provincial and Federal legislation and regulations.
- .2 Ensure materials are properly packaged and labeled prior to transportation.
- .3 Transport hazardous waste materials in properly placarded vehicles.
- .4 Each load to be accompanied by completed Transportation of Dangerous Goods Regulation (TDGR) Waste Manifest.

### **3.7 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS**

- .1 Repair or replace objects damaged in course of work to their original state or better, as directed by Departmental Representative.

**END OF SECTION**

**Part 1        General**

**1.1        REFERENCES**

- .1    ASTM International
  - .1    ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .2    ASTM A480/A480M-16, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
  - .3    ASTM B209-14, Aluminum and Aluminum-Alloy Sheet and Plate.
- .2    Canadian General Standards Board (CGSB)
  - .1    CAN/CGSB 1.105-M91, Quick Drying Primer.
- .3    Canadian Standards Association (CSA)
  - .1    CSA G40.20-04/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2    CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .3    CSA W59-13, Welded Steel Construction (Metal Arc Welding) [Metric].
- .4    Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
  - .1    CISC/CPMA 2-75, Quick Drying Primer for Use on Structural Steel.
- .5    Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1    Material Safety Data Sheets (MSDS).

**1.2        SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1    Submit manufacturer's instructions, printed product literature and data sheets for sections, plates, and bolts; include product characteristics, performance criteria, physical size, finish and limitations.
  - .2    Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3    Shop Drawings:
  - .1    Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
- .4    Certifications: Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

### **1.3 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Ensure materials comply with Correctional Service Canada (CSC) Technical Criteria, 2015.
- .2 Steel sections and plates: To CSA G40.20/G40.21, Grade 300W
- .3 Stainless steel strip, sheet, and plate: To ASTM A480/A480M.
- .4 Aluminum plate: To ASTM B209.
- .5 Welding materials: To CSA W59.
- .6 Welding electrodes: To CSA W48 Series.
- .7 Bolts and anchor bolts: To ASTM A307.

### **2.2 FABRICATION**

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use countersunk tamper-proof headed screws on items requiring assembly by screws as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

### **2.3 ISOLATION COATING**

- .1 Isolate aluminum from following components, by means of bituminous paint:
  - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
  - .2 Concrete, mortar, and masonry.

### **2.4 SHOP PAINTING**

- .1 Apply one shop coat of primer to steel items.

- .1 Shop coat primer: To CISC/CPMA 2-75 or CAN/CGSB-1.105.
- .2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, and grease. Do not paint when temperature is lower than 7°C.
- .2 Finish coat for steel items: Powder coat finish.

## **2.5 GUN PORTS**

- .1 Fabricate gun ports from materials and to sizes indicated on drawings.
  - .1 Steel components: Powder coated.
  - .2 Aluminum components: Mill finish.

## **2.6 STEEL PANELS AND ANGLES**

- .1 Fabricate panels, plates, and angles from materials and to sizes indicated on drawings.
  - .1 Finish: Prime painted.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verify conditions of substrates are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate.
  - .2 Inform Departmental Representative of unacceptable conditions.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 INSTALLATION**

- .1 Perform welding work in accordance with CSA W59 unless specified otherwise.
- .2 Install metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Ensure exposed fastening devices are compatible with material through which they pass.
- .4 Supply components for work by other trades in accordance with shop drawings and schedule.
- .5 Make field connections with bolts as indicated.

### **3.3 CLEANING**

- .1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

- .4 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

### **3.4 PROTECTION**

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

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM C881/C881M-15, Epoxy-Resin-Base Bonding Systems for Concrete.
  - .2 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants.
  - .3 ASTM C1193-13, Standard Guide for Use of Sealants.
  - .4 ASTM C1311-10, Standard Specification for Solvent Release Sealants.
  - .5 ASTM C1330-02 (2013), Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.2 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants. Include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Manufacturer's product to describe:
    - .1 Primers.
    - .2 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
  - .3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Manufacturer's Instructions:
  - .1 Submit instructions to include installation instructions for each product used.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Submit operation and maintenance data for incorporation into manual.

**1.4 QUALITY ASSURANCE**

- .1 Compatibility: Verify sealants used are compatible with their respective joint substrates.
- .2 Provide sealants with appropriate expansion and contraction properties for the joints being sealed.

- .3 Perform sealant application work to ASTM C1193.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 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 Replace defective or damaged materials with new.

## **1.6 SITE CONDITIONS**

- .1 Ambient Conditions:
  - .1 Proceed with installation of joint sealants only when:
    - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4°C.
    - .2 Joint substrates are dry.
    - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Joint-Width Conditions:
  - .1 Proceed with installation of joint sealants only where joint widths are within range allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
  - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

## **1.7 ENVIRONMENTAL REQUIREMENTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.
- .2 Departmental Representative to arrange for ventilation system to be operated on maximum outdoor air and exhaust during installation of caulking and sealants.

## **Part 2 Products**

### **2.1 SEALANT MATERIALS**

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

- .2 When low toxicity caulks are not possible, confine usage to areas that off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Where sealants are qualified with primers, use only these primers.
- .4 Hybrid Polyurethane Sealant: To ASTM C920, Type S, Grade NS, Class 35; non-sag, single component.
  - .1 Uses: Perimeter caulking of door frames.
- .5 Security sealant: To ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polyurethane, purpose-designed as a tamper-resistant security sealant.
  - .1 Ensure security sealant is compatible with polycarbonate glazing.
  - .2 Provide primer as required for substrate by sealant manufacturer.
  - .3 Use: Sealant for attack side of installations as indicated.
- .6 Butyl: To ASTM C1311, single component, butyl rubber sealant.
  - .1 Use: Gun port glazing. Confirm compatibility of butyl sealant with polycarbonate glazing manufacturer.
- .7 Preformed compressible and non-compressible back-up materials:
  - .1 Polyethylene foam: Extruded closed cell round foam backer rod, to ASTM C1330 Type C.
    - .1 Size: oversize 30 to 50%.
  - .2 Neoprene or butyl rubber:
    - .1 Round solid rod, Shore A hardness 70.
  - .3 Bond breaker tape:
    - .1 Polyethylene bond breaker tape that will not bond to sealant.
- .8 Primer: As recommended by sealant manufacturer, where required, for adhesion of sealant to substrate.

## **2.2 JOINT CLEANER**

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.
- .2 Primer: in accordance with sealant manufacturer's written recommendations.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verify conditions of substrates are acceptable for joint sealant installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate.
  - .2 Inform Departmental Representative of unacceptable conditions.



- .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 SURFACE PREPARATION**

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter that may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

### **3.3 PRIMING**

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime joint substrates as recommended by sealant manufacturer immediately prior to caulking.

### **3.4 BACKUP MATERIAL**

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

### **3.5 MIXING**

- .1 Mix materials in accordance with sealant manufacturer's instructions.

### **3.6 APPLICATION**

- .1 Sealant:
  - .1 Mask edges of joint where irregular surface or sensitive joint border exists, to provide neat joint.
  - .2 Apply sealant in continuous beads.
  - .3 Apply sealant using gun with proper size nozzle.
  - .4 Use sufficient pressure to fill voids and joints solid.
  - .5 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
  - .6 Tool exposed surfaces before skinning begins to give slightly concave shape.
  - .7 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing:

- .1 Cure sealants in accordance with sealant manufacturer's instructions.
- .2 Do not cover up sealants until proper curing has taken place.

### **3.7 CLEANING**

- .1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Clean adjacent surfaces immediately.
  - .3 Remove excess and droppings, using recommended cleaners as work progresses.
  - .4 Remove masking tape after initial set of sealant.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

### **3.8 PROTECTION**

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

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM A653/A653M-13, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2 ASTM C109/C109M-16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA)
  - .1 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
  - .1 CSDMA Recommended Specifications for Commercial Steel Doors and Frame Products, 2006.
  - .2 CSDMA Recommended Selection and Usage Guide for Commercial Steel Door and Frame Products, 2009.

**1.2 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings:
  - .1 Indicate door material, steel thicknesses, reinforcements, location of exposed fasteners, openings, arrangement of hardware, and finishes.
  - .2 Indicate each type of frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, reinforcing, and finishes.
  - .3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

**1.3 MOCK-UPS**

- .1 Submit mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Catwalk Grille Type 1: Fabricate door and frame assembly complete with glazing and hardware as shown in Sheet A1.4, Detail 2 and Detail 6.
- .3 Install on-site in location as directed by Departmental Representative.
  - .1 Coordinate with Departmental Representative for date, time, and on-site location for installation, presentation, and review of mock-up.
- .4 Allow for review of mock-up by Departmental Representative before proceeding with metal door installation.

- .5 Mock-up will be used to judge quality of work, substrate preparation, and material application.
- .6 Accepted mock-up will demonstrate minimum standard of quality required for this Work.
- .7 Accepted mock-up may remain as part of finished Work.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, handle, and store doors and frames at the job site in such manner as to prevent damage.
- .3 Store doors and frames under cover with doors stored in a vertical position on blocking, clear of floor, and with blocking between doors to permit air circulation.
- .4 Waste Management and Disposal: Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Hot dipped galvanized steel sheet: To ASTM A653/A653M, CS Type B, galvanizing thickness Z120 (G40).
- .2 Core material: Fibreglass, semi-rigid, density 24 kg/m<sup>3</sup>.

#### **2.2 PAINT**

- .1 Touch-up primer to CAN/CGSB 1.181.
- .2 Field paint steel doors and frames in accordance with Section 09 91 00 – Painting. Provide final finish free of scratches or other blemishes.

#### **2.3 ACCESSORIES**

- .1 Door Hardware and Weatherstripping: Specified in Section 08 71 00.
- .2 Door silencers: Single stud rubber/neoprene type.
- .3 Metallic paste filler: To manufacturer's standard.
- .4 Sealant: Refer to Section 07 92 00 – Joint Sealing.
- .5 Glazing Stops: Formed galvanized steel angle, 4.0 mm thick, to provide minimum 25 mm (1 inch) engagement on glazing, accurately fitted, butted at corners and fastened to frame sections with counter-sunk 9.6 mm security screws.
  - .1 Attach stops with security screws at 200 mm on center.
- .6 Glazing: Refer to Section 08 80 50 – Glazing.
- .7 Glazing film: Refer to Section 08 87 00 – Glazing Films.
- .8 Finish painting: Refer to Section 09 91 00 – Painting.

- .9 Repair mortar: To ASTM C109, pre-mixed polymer-modified, rapid-setting, low sag, trowel-applied, and acceptable for vertical and overhead application.
- .1 Compressive strength: 27.6 MPa (4000 psi) at 24 hrs.

## **2.4 FRAMES FABRICATION GENERAL**

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and face sizes as indicated.
- .3 Frames: 1.6 mm thick cold rolled steel, welded type construction.
- .4 Blank, reinforce, drill and tap frames for templated hardware, using templates provided by finish hardware supplier. Reinforce frames for hardware mounting.
- .5 Manufacturer's nameplates on frames and screens are not permitted.
- .6 Conceal fastenings except where exposed fastenings are indicated.
- .7 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

## **2.5 FRAMES: WELDED TYPE**

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails, and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.

## **2.6 FRAME ANCHORAGE**

- .1 Provide appropriate anchorage to existing wall construction as indicated.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

## **2.7 DOOR FABRICATION GENERAL**

- .1 Doors: Swing type, flush.
- .2 Form face sheets for doors from 1.3 mm sheet steel.
- .3 Laminate fibreglass core to face sheets under pressure.
- .4 Fabricate doors with longitudinal edges welded.
  - .1 Seams: Grind welded joints to a flat plane, fill with automotive body filler and sand flush.
- .5 Blank, reinforce, drill doors and tap for templated hardware.
- .6 Reinforce doors for attachment of hardware, including hinges and latchsets.
- .7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

- .8 Manufacturer's nameplates on doors are not permitted.

### **Part 3 Execution**

#### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

#### **3.2 INSTALLATION GENERAL**

- .1 Install doors and frames to CSDMA Installation Guide.

#### **3.3 FRAME INSTALLATION**

- .1 Set frames plumb, square, level, and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Caulk perimeter of frames between frame and adjacent material.

#### **3.4 DOOR INSTALLATION**

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs.
- .3 Adjust operable parts for correct function.

#### **3.5 FINISH REPAIRS**

- .1 Touch up, with primer, finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.
- .3 Patch damaged cementitious substrates to smooth finish as required with pre-mixed repair mortar.

#### **3.6 GLAZING**

- .1 Install glazing for doors and frames in accordance with Section 08 80 50 - Glazing.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
  - .1 ANSI/BHMA A156.1-2013, American National Standard for Butts and Hinges.
  - .2 ANSI/BHMA A156.2-2011, Bored and Preamsembled Locks and Latches.
  - .3 ANSI/BHMA A156.22-2012, Door Gasketing and Edge Seal Systems.

**1.2 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish, and limitations.
- .3 Manufacturer's Instructions: Submit manufacturer's installation instructions.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Submit operation and maintenance data for door hardware for incorporation into manual.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, well-ventilated area.
  - .2 Store and protect door hardware from nicks, scratches, and blemishes.
  - .3 Protect prefinished surfaces with wrapping or strippable coating.
  - .4 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 DOOR HARDWARE**

- .1 Cylindrical latch set: To ANSI/BHMA A156.2, Series 4000, Grade 1, all metal construction. Brushed stainless steel finish.
  - .1 Latchbolt: Minimum 13 mm throw.

- .2 Lever: Solid cast.
- .3 Rose: Heavy wrought.
- .4 Strikes: Curved lip, 124 mm height, complete with wrought boxes.
- .2 Hinges: To BHMA A156.1, five-knuckle, standard weight, 0.134 gauge steel, non-removable pins.
- .3 Perimeter gasketing: To ANSI/BHMA A156.22 Category J, extruded tempered aluminum retainer, alloy 6063-T6; with black sponge silicone seal, heavy duty type; stainless steel fasteners.

## **2.2 FASTENINGS**

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

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Manufacturer's Instructions: Comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for installation of hardware.
- .4 Install hardware as indicated.
- .5 Where doorstop contacts door pulls, mount stop to strike bottom of pull.

### **3.2 ADJUSTING**

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

### **3.3 CLEANING**

- .1 Progress Cleaning: in accordance with Section 01 74 00 - Cleaning.
  - .1 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
  - .2 Remove protective material from hardware items where present.



- .2 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

### **3.4 PROTECTION**

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

### **3.5 HARDWARE SCHEDULE**

- .1 G1: Gallery Grille Door.
  - .1 Cylinder latch set:
    - .1 Lever on Operations side, always free, unkeyed.
    - .2 Blank plate on attack side.
  - .2 Hinges x 2: 4-1/2" x 4", non-removable pins.
  - .3 Perimeter gasketing on all sides.

**END OF SECTION**

**Part 1        General**

**1.1        REFERENCES**

- .1    ASTM International
  - .1    ASTM C920-14, Elastomeric Joint Sealants.
  - .2    ASTM D790-10, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
  - .3    ASTM D1003-11e1, Standard Test Method for Haze and Luminous Transmittance of Plastics.
  - .4    ASTM F1233-08, Standard Test Method for Security Glazing Materials and Systems.
- .2    Canadian General Standards Board (CGSB)
  - .1    CAN/CGSB 12.1-2017, Safety Glazing.
- .3    Glass Association of North American (GANA)
  - .1    GANA Glazing Manual - 2008.
  - .2    GANA Laminated Glazing Reference Manual - 2009.
- .4    Underwriters Laboratories (UL)
  - .1    UL 752 (2005), Standard for Bullet-Resisting Equipment.

**1.2        ADMINISTRATIVE REQUIREMENTS**

- .1    Pre-Installation Meetings:
  - .1    Convene pre-installation meeting with Departmental Representative, one week prior to beginning on-site installation, in accordance with Section 01 31 19 - Project Meetings, to:
    - .1    Verify project requirements.
    - .2    Review installation and substrate conditions.
    - .3    Co-ordination with other building subtrades.
    - .4    Review manufacturer's written installation instructions and warranty requirements.
- .2    Arrange for site visit with Departmental Representative prior to start of Work to examine existing site conditions.
- .3    Ensure key personnel attend.
- .4    Departmental Representative will submit written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

**1.3        SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories; 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 Alberta.
- .4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit maintenance data for glazing for incorporation into O&M manual.

#### **1.5 QUALITY ASSURANCE**

- .1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

#### **1.6 MOCK-UP**

- .1 Submit mock-ups in accordance with Section 01 45 00 - Quality Control.
- .2 Provide gun-port mock-ups for review at off-site location prior to installation on site.
  - .1 Coordinate with Departmental Representative for date, time, and off-site location for presentation and review of mock-up.
- .3 Mock-Up 1, gun port in door: Fabricate sample gun port glazing assembly as shown in Sheet A1.2, Details 7 and 13, using specified materials and methods.
  - .1 Plywood cut to same size as existing door may be used in lieu of existing door for fabrication of mock-up.
- .4 Mock-Up 2, gun port in glazing: Fabricate full sized sample glazing panel with gun port assembly installed, as shown on Sheet A1.2, Detail 11, using specified materials and methods.
- .5 Mock-ups will be used to judge quality of work, substrate preparation, and material application.
- .6 Accepted mock-ups will demonstrate minimum standard of quality required for this Work.
- .7 Accepted Mock-Up 1, if installed in door, may be installed on site as part of finished Work.
- .8 Accepted Mock-Up 2 may be installed on site as part of finished Work.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect glazing and frames from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Polycarbonate security glazing: Polycarbonate, thickness as indicated, laminated, with each lamination separated by plastic film, abrasion-resistant surface.
  - .1 Colour: Clear.
  - .2 Ballistic performance (ASTM F1233): Meeting Class/Level HG4 Ballistics and Class IV Forced Entry.
  - .3 Flexural strength (ASTM D790): 13,500 psi.
  - .4 Light transmittance (ASTM D1003): 87%.
  - .5 Bullet resistance (UL 752): Level 3.
- .2 Glass glazing: To CAN/CGSB 12.1, clear, tempered, 6 mm thick.

### **2.2 GUN PORTS**

- .1 Refer to Section 05 50 00 - Metal Fabrications.

### **2.3 ACCESSORIES**

- .1 Confirm compatibility of glazing accessories with polycarbonate glazing.
  - .1 Setting blocks: Santoprene, PVC, EPDM, or neoprene Shore A durometer  $85 \pm 5$ .
  - .2 Glazing tape: Preformed butyl compound, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; sized to suit installation; black colour.
  - .3 Sealant: Silicone sealant to ASTM C920, Type S, Grade NS, Use NT; chemically compatible with polycarbonate sheet and glass setting accessories.
- .2 Plastic Glazing Film: in accordance with Section 08 87 00 – Glazing Surface Films.

**Part 3            Execution**

**3.1                EXAMINATION**

- .1    Verify conditions of substrates are acceptable for glazing installation in accordance with manufacturer's written instructions.
  - .1    Verify that openings for glazing are correctly sized and within tolerance.
  - .2    Verify that surfaces of glazing channels or recesses are clean, free of burrs and projections, and ready to receive glazing.
  - .3    Visually inspect substrate.
  - .4    Inform Departmental Representative of unacceptable conditions.
  - .5    Proceed with installation only after unacceptable conditions have been remedied.

**3.2                PREPARATION**

- .1    In existing installations where glazing is to be replaced, remove old sealant and residue.
- .2    Clean contact surfaces with solvent and wipe dry.
- .3    Prime surfaces scheduled to receive sealant.

**3.3                INSTALLATION: GLAZING**

- .1    Install in locations indicated in accordance with GANA Glazing Manual and manufacturer's written instructions.
- .2    Install glazing to frames and doors to clearances and engagements recommended by glazing manufacturer, and protect glazing from excessive pressure and metal-to glazing contact that may cause failure of glazing.
- .3    Install glazing films in accordance with Section 08 87 00 – Glazing Films.

**3.4                INSTALLATION: GUN PORTS**

- .1    Install gun ports to glazing where indicated.
- .2    Install gun ports plumb and level, neat in appearance, and free from defects.
- .3    Secure gun ports rigidly in place. Do not over-torque attachment bolts.
- .4    Ensure that installed gun ports latch and seal correctly and operate smoothly.

**3.5                CLEANING**

- .1    Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1    Leave Work area clean at end of each day.
    - .1    Remove traces of primer, caulking.
    - .2    Remove glazing materials from finish surfaces.
    - .3    Remove labels.
    - .4    Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .2 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

### **3.6 PROTECTION**

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

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM D882-12, Tensile Properties of Thin Plastic Sheetings.
  - .2 ASTM D4830/D4830M-98 (2014)e1, Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.
  - .3 ASTM D1044-13, Resistance of Transparent Plastics to Surface Abrasion.
  - .4 ASTM E308-08, Standard Practice for Computing the Colors of Objects by Using the CIE System.
  - .5 ASTM E903-12, Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
- .2 Government of Canada
  - .1 Canada Labour Code, WHMIS datasheets.

**1.2 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Data Sheets in accordance with Section 01 35 29.06 – Health and Safety Requirements.
- .3 Product data: Manufacturer's current technical literature on each product proposed.
  - .1 Manufacturer's data sheets.
  - .2 Preparation instructions and recommendations.
  - .3 Storage and handling requirements and recommendations.
  - .4 Installation methods.
- .4 Samples:
  - .1 Submit duplicate manufacturer's samples of specified films, minimum 150 x 150 mm (6 x 6 inches).
- .5 Closeout Submittals:
  - .1 Provide maintenance data for window film for incorporation into O&M manual specified in Section 01 78 00 - Closeout Submittals.
  - .2 Follow manufacturers written instructions for care and maintenance of glazing film.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Provide and maintain dry, off-ground weatherproof storage.

- .3 Store rolls of film flat on cross supports. Do not stand rolls of film on end.
- .4 Remove from storage, in quantities required for same day use.
- .5 Store materials in accordance with manufacturers written instructions.
- .6 Waste Management and Disposal:
  - .1 Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, and with Waste Reduction Workplan.
  - .2 Place materials defined as hazardous or toxic waste in designated containers.
  - .3 Ensure emptied containers are sealed and stored safely.

#### **1.4 MAINTENANCE DATA**

- .1 Provide operation and maintenance data for window film for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Scratch resistant film: Polyester film with abrasion-resistant coating, optically clear, with pressure-sensitive adhesive and release liner.
  - .1 Minimum thickness: 0.15 mm (6 mils).
  - .2 Abrasion resistance (ASTM D1044): < 2% increase in haze.
  - .3 Tensile strength (ASTM D882): 25,000 psi.
  - .4 Break strength (ASTM D882): 150 lb/in.
  - .5 Puncture strength (ASTM D4830): 125 lbs.
  - .6 Colour: Clear.
- .2 Mirror film: Polyester film for application to glass to effect a reflective one-way mirror, with pressure-sensitive adhesive and release liner.
  - .1 Minimum thickness: 0.070 mm (2.7 mils).
  - .2 Characteristics to ASTM E903 and ASTM E308 when applied to 3 mm glass:
    - .1 Visible light transmittance: 0%.
    - .2 Visible light reflectance – interior: 91%.
  - .3 Colour: Silver.

#### **2.2 FABRICATION**

- .1 Shop installation of film to glazing panels:
  - .1 Ensure dust, grease, and chemical residue are removed from surface of glazing before installation of film.



- .2 Examine glazing under natural daylight and identify cracks, blisters, bubbles, discolouration, edge defects or other anomalies that may cause film to delaminate, or cause vision transparency or distortion problems.
- .3 View glazing from 2.0 metres minimum. Report findings to Departmental Representative.
- .4 Proceed with Work only after receipt of approval from Departmental Representative.
  - .1 Install film to glazing panels ensuring no blisters, bubbles, scratches, edge defects or distortions.
  - .2 Cut film edges straight and square to within 3 mm of edge of panel.

### **Part 3 Execution**

#### **3.1 PREPARATION**

- .1 Clean glazing before beginning installation using neutral cleaning solution.
- .2 Ensure no deleterious material adheres to glazing.
- .3 Ensure dust, grease, and chemical residue are removed from surface of glazing before installation of film.
- .4 Examine glazing under natural daylight and identify cracks, blisters, bubbles, discolouration, edge defects or other anomalies that may cause film to delaminate or cause vision transparency or distortion problems. Report findings to Departmental Representative.
- .5 Proceed with Work only after receipt of written approval from Departmental Representative.

#### **3.2 INSTALLATION**

- .1 Field Installation of Glazing Film:
  - .1 Remove window stops and window sealing device.
  - .2 Ensure dust, grease, and chemical residue are removed from surface of glazing before installation of film.
  - .3 Examine glazing under natural daylight and identify cracks, blisters, bubbles, discolouration, edge defects or other anomalies that may cause film to delaminate, or cause vision transparency or distortion problems. Report findings to Departmental Representative before starting Work.
  - .4 Proceed with Work only after receipt of written approval from Departmental Representative.
  - .5 Install glazing film to glazing windows ensuring no blisters, bubbles, scratches or distortions.
- .2 Cut film edges straight and square.
- .3 Cut edges in accordance with manufacturer's written instructions.

- .4 Apply and attach film to glazing in accordance with manufacturer's written instructions.
- .5 Splicing:
  - .1 Splice film only when glazing is greater in width than film.
  - .2 Splice film only after receipt of written approval from Departmental Representative.
  - .3 Use butted factory edges only.
  - .4 Ensure maximum overlap of 3 mm.
- .6 Use only water and film slip solution on glazing to facilitate positioning of film.
- .7 Ensure removal of excess water from between film and glazing.
- .8 Remove left over material from work area and return work area to original condition.

### **3.3 INSTALLER'S INSPECTION**

- .1 Visual Inspection: in accordance with IWFA - Visual Quality Standard for Applied Window Film.
- .2 Remove and replace film that continues to show blisters, bubbles, tears, scratches, edge defects or vision distortion in film when viewed under natural daylight from 2.0 metres minimum after 30 day period.

### **3.4 FINAL CLEANING**

- .1 Wash interior and exterior of each window and film using cleaning solution recommended by film manufacturer.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM C645-14, Standard Specification for Nonstructural Steel Framing Members.
  - .2 ASTM C754-11, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 1.181-99, Ready-Mixed Zinc-Rich Coating.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.2 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for metal framing. Include product characteristics, performance criteria, physical size, finish and limitations.

**1.3 QUALITY ASSURANCE**

- .1 Certificates: Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect metal framing from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Non-load bearing channel stud framing: To ASTM C645, stud size as shown on drawings, roll formed from hot dipped galvanized steel sheet, for screw attachment of gypsum board.
  - .1 Steel minimum thickness unless otherwise indicated on drawings:
    - .1 0.84 mm (0.033 inches).
  - .2 Knock-out service holes at 460 mm centres.
  - .3 Floor and ceiling tracks: In widths to suit stud sizes, 32 mm flange height.
- .2 Metal channel stiffener: 1.4 mm (16 gauge) thick cold rolled steel, coated with rust inhibitive coating.
- .3 Touch-up primer for galvanized surfaces: CAN/CGSB 1.181.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verify that conditions of substrate are acceptable for non-structural metal framing application in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate.
  - .2 Inform Departmental Representative of unacceptable conditions.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 ERECTION**

- .1 Align partition tracks at floor and ceiling and secure at maximum 600 mm on centre.
- .2 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- .3 Place studs vertically at 400 mm on centre and not more than 50 mm from abutting walls, and at each side of openings and corners.
  - .1 Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .4 Erect metal studding to tolerance of 1:1000.
- .5 Attach studs to track using pop rivets.
- .6 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .7 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified.

- .1 Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .9 Install heavy gauge single jamb studs at openings.
- .10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs.
  - .1 Secure track to studs at each end, in accordance with manufacturer's instructions.
  - .2 Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .11 Frame openings and around built-in equipment, doors, and access panels on all four sides. Extend framing into reveals. Check clearances with equipment suppliers.

### **3.3 CLEANING**

- .1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .4 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

### **3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by non-structural metal framing application.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .2 Environmental Protection Agency (EPA)
  - .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - [1995], (for Surface Coatings).
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .4 Master Painters Institute (MPI)
  - .1 MPI Architectural Painting Specifications Manual, 2014.
  - .2 MPI Maintenance Repainting Manual, 2015.
  - .3 MPI Approved Products List, 2016.
- .5 National Fire Code of Canada 2015.
- .6 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

**1.2 SCHEDULING**

- .1 Submit work schedule for various stages of painting to Departmental Representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Departmental Representative for changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants.

**1.3 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit product data and instructions for each paint and coating product to be used.
  - .2 Submit product data for the use and application of paint thinner.
  - .3 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) for products used in the project. Indicate VOCs during application and curing.
- .3 Samples:

- .1 Submit full range colour sample chips to indicate where colour availability is restricted.
- .2 Submit duplicate 200 x 200 mm sample panels of each paint and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:
  - .1 3 mm plate steel for finishes over metal surfaces.
  - .2 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
  - .3 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
- .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
- .4 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Manufacturer's Instructions:
  - .1 Submit manufacturer's application instructions.
- .6 Closeout Submittals: Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:
  - .1 Product name, type and use.
  - .2 Manufacturer's product number.
  - .3 Colour numbers.

#### **1.4 MAINTENANCE**

- .1 Extra Materials:
  - .1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.
  - .2 Quantity: provide one x 4 litre can of each type and colour of primer and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.
  - .3 Delivery, storage and protection: comply with Departmental Representative requirements for delivery and storage of extra materials.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, Shipping, Handling and Unloading:
  - .1 Pack, ship, handle, and unload materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
- .2 Acceptance at Site:
  - .1 Identify products and materials with labels indicating:

- .1 Manufacturer's name and address.
  - .2 Type of paint or coating.
  - .3 Compliance with applicable standard.
  - .4 Colour number in accordance with established colour schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Storage and Protection:
  - .1 Provide and maintain dry, temperature controlled, secure storage.
  - .2 Store materials and supplies away from heat generating devices.
  - .3 Store materials and equipment in well-ventilated area within temperature range 7°C to 30°C.
- .5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.
- .7 Remove paint materials from storage only in quantities required for same day use.
- .8 Fire Safety Requirements:
  - .1 Provide one 9 kg dry chemical fire extinguisher adjacent to storage area.
  - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
  - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.
- .9 Waste Management and Disposal:
  - .1 Remove waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
  - .2 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional, and Municipal regulations.
  - .3 Ensure emptied containers are sealed and stored safely.
  - .4 Dispose unused paint and coating materials at official hazardous material collections site.
  - .5 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
  - .6 Material that cannot be reused is to be treated as hazardous waste and disposed of in an appropriate manner.
  - .7 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.



- .8 To reduce the amounts of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
  - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
  - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
  - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
  - .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
  - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .9 Set aside and protect surplus and uncontaminated finish materials. Turn over to Departmental Representative for maintenance purposes.

## **1.6 SITE CONDITIONS**

- .1 Heating, Ventilation and Lighting:
  - .1 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
  - .2 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
  - .3 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
  - .1 Unless pre-approved with written approval by Specifying body and product manufacturer, perform no painting when:
    - .1 Ambient air and substrate temperatures are below 10°C.
    - .2 Substrate temperature is above 32°C unless paint is specifically formulated for application at high temperatures.
    - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
    - .4 The relative humidity is under 85% or when the dew point is more than 3°C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3°C below the ambient or surface temperature.
    - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
    - .6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.

- .2 Perform painting work when maximum moisture content of the substrate is below:
  - .1 Allow new concrete and masonry to cure minimum of 28 days.
  - .2 12% for plaster and gypsum board.
- .3 Surface and Environmental Conditions:
  - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
  - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
  - .3 Apply paint when previous coat of paint is dry or adequately cured.
- .4 Additional interior application requirements:
  - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Conform to latest MPI requirements for painting work, including preparation and priming.
- .4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.
- .5 Provide zero-VOC paints for the project.
- .6 Use MPI listed materials having minimum E3 rating where indoor air quality (odour) requirements exist.

### **2.2 MIXING AND TINTING**

- .1 Perform colour-tinting operations prior to delivery of paint to site. Obtain written approval from Departmental Representative for tinting of painting materials.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

## 2.3 GLOSS/SHEEN RATINGS

- .1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

|   | Gloss @ 60 degrees | Sheen @ 85 degrees |
|---|--------------------|--------------------|
| Gloss Level 1 - Matte Finish (flat)           | Max. 5             | Max. 10            |
| Gloss Level 2 - Velvet-Like Finish            | Max.10             | 10 to 35           |
| Gloss Level 3 - Eggshell Finish               | 10 to 25           | 10 to 35           |
| Gloss Level 4 - Satin-Like Finish             | 20 to 35           | min. 35            |
| Gloss Level 5 - Traditional Semi-Gloss Finish | 35 to 70           |                    |
| Gloss Level 6 - Traditional Gloss             | 70 to 85           |                    |
| Gloss Level 7 - High Gloss Finish             | More than 85       |                    |

- .2 Gloss level ratings of painted surfaces as indicated.

## 2.4 INTERIOR PAINTING SYSTEMS

- .1 Concrete Unit Masonry:
- .1 INT 4.2D – High performance architectural latex, G3.
    - .1 Coat 1: Latex block filler, MPI #4.
    - .2 Coats 2 and 3: HIPAC latex, MPI #139.
  - .2 Metal: Doors, frames:
    - .1 INT 5.3M – High performance architectural latex over water based galvanized primer, semi-gloss finish.
      - .1 Coat 1: Water-based galvanized primer, MPI #134.
      - .2 Coats 2 and 3: HIPAC latex, MPI #141.
  - .3 Gypsum wallboard, include access panels:
    - .1 INT 9.2B - High performance architectural latex.
      - .1 Walls: G4 finish.
        - .1 Coat 1: Latex primer/sealer, MPI #50.
        - .2 Coats 2 and 3: HIPAC latex, MPI #140.
      - .2 Ceilings: G3 finish.
        - .1 Coat 1: Latex primer/sealer, MPI #50.
        - .2 Coats 2 and 3: HIPAC latex, MPI #139.

## 2.5 INTERIOR REPAINTING

- .1 Concrete Unit Masonry:
- .1 RIN 4.2K – High performance architectural latex, G3.

- .1 Touch-up, spot prime: MPI #139.
  - .2 Coats 1 and 2: MPI #139.
- .2 Metal: Doors, frames.
  - .1 RIN 5.3J – High performance architectural latex, G5 finish.
    - .1 Coat 1: Touch-up, MPI #141.
    - .2 Coats 2 and 3: HIPAC latex, MPI #141.
- .3 Gypsum wallboard:
  - .1 RIN 9.2B – High performance architectural latex.
    - .1 Walls: G4 finish.
      - .1 Coat 1: Touch-up, MPI #140.
      - .2 Coats 2 and 3: HIPAC latex, MPI #140.
    - .2 Ceilings: G3 finish.
      - .1 Coat 1: Touch-up, MPI #139.
      - .2 Coats 2 and 3: HIPAC latex, MPI #139.

### **Part 3 Execution**

#### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.

#### **3.2 GENERAL**

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

#### **3.3 EXAMINATION**

- .1 Prior to commencing work, examine site conditions and existing substrates to be painted and repainted. Report to Departmental Representative damages, defects, or unsatisfactory or unfavourable conditions or surfaces that will adversely affect this work.
- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Do not commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to Painting Subcontractor and Inspection Agency.

- .4 Assess degree of surface deterioration for areas to be repainted, using MPI identifiers and assessment criteria indicated in MPI Repainting Manual. MPI DSD ratings and descriptions are as follows:

| Condition | Description  |
|-----------|--|
| DSD-0     | Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).                             |
| DSD-1     | Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes, scratches).    |
| DSD-2     | Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, and staining).                                |
| DSD-3     | Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges). |
| DSD-4     | Substrate Damage (repair or replacement of surface required).  |

- .5 Where an assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects discovered are to be corrected, as mutually agreed, before repainting is started.
- .6 Maximum moisture content as follows:
- .1 Gypsum board, stucco, and plaster: 12%.
  - .2 Concrete: 12%.
  - .3 Clay and Concrete Block/Brick: 12%.

### 3.4 PREPARATION

- .1 Protection:
- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings, and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
  - .2 Protect items that are permanently attached such as fire labels on doors and frames.
  - .3 Protect factory finished products and equipment.
  - .4 Protect passing pedestrians, building occupants, and general public in and about the building.
- .2 Surface Preparation:
- .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
  - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
  - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to be acceptable to Departmental Representative.

- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual and Maintenance Repainting Manual requirements. Refer to MPI Manual for specific requirements and as follows:
  - .1 Remove dust, dirt, and other surface debris by vacuuming and wiping with dry, clean cloths.
  - .2 Wash surfaces with a biodegradable detergent, bleach where applicable, and clean warm water, using stiff bristle brush to remove dirt, oil, and other surface contaminants.
  - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
  - .4 Allow surfaces to drain completely and allow to dry thoroughly.
  - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
  - .6 Use trigger operated spray nozzles for water hoses.
  - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
- .4 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes and vacuum cleaning.
- .5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .6 Touch up of shop primers with primer as specified.
- .7 Do not apply paint until prepared surfaces are acceptable to Departmental Representative.
- .8 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

### **3.5 APPLICATION**

- .1 Method of application to be as approved by Departmental Representative. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
  - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
  - .2 Work paint into cracks, crevices and corners.
  - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
  - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.

- .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .4 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time as recommended by manufacturer.
- .6 Sand and dust between coats to remove visible defects.
- .7 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .8 Repaint top, bottom, and vertical edges of doors to be repainted.
- .9 Finish closets and alcoves as specified for adjoining rooms.
- .10 Finish top, bottom, edges and cut-outs of doors after fitting as specified for door surfaces.

### **3.6 SITE TOLERANCES**

- .1 Walls: No defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Ceilings: No defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

### **3.7 RESTORATION**

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 21 Wire & Cable (0-1000 V).
- .2 Section 26 05 29 Hangers & Support for Electrical Systems.
- .3 Section 26 05 31 Splitters, Junction, Pull Boxes and Cabinets.
- .4 Section 26 05 32 Outlet Boxes, Conduit Boxes and Fittings.
- .5 Section 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings

**1.2 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 Reference Standards:
  - .1 CSA Group
    - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24<sup>th</sup> Edition), ), Safety Standard for Electrical Installations and CE Code Handbook. Amendments for Provinces.
    - .2 CAN3 C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
  - .2 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.
  - .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
    - .1 Material Safety Data Sheets (MSDS).
  - .4 National Research Council of Canada
    - .1 Model National Energy Code of Canada for Buildings 2017.
    - .2 Underwriters' Laboratories of Canada (ULC)

**1.3 DESIGN AND PERFORMANCE REQUIREMENTS**

- .1 Design equipment, components, and assemblies to operate satisfactorily at 60 Hz, within normal operating limits established within CAN3 C235.
- .2 Provide equipment designed to operate in normal interior operating limits specified in CAN3 C235, without damage to equipment or failure of service.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

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



- .2 Submit requested documentation to Departmental Representative.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada and Health Canada for applicable electrical equipment and material. Indicate applicable VOC content.
- .4 Certificates:
  - .1 Provide CSA certified material.
  - .2 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .5 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

## **1.5 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
- .2 Indicate project layout including wiring schematic diagrams. Indicate dimensions, capacities, weights and performance characteristics.
- .3 Indicate product and material data detailing of electrical and electronic equipment.

## **1.6 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate samples of equipment and components.
- .3 After review and acceptance, samples will be returned for incorporation into work.

## **1.7 TEST REPORTS**

- .1 Submit certified test reports and certificates to Departmental Representative from approved independent testing laboratories.
  - .1 Indicate compliance with specifications for specified performance characteristics and physical properties.
  - .2 Manufacturer's Field Services: submit copies of manufacturer's field inspection reports.

## **1.8 CERTIFICATES**

- .1 Submit inspection reports and certificates of acceptance from authorities having jurisdiction to Departmental Representative, at Substantial Completion.
- .2 Obtain and pay for necessary permits, licenses, inspections and fees required.

- .3 Certificates: submit certificates signed by product or component manufacturers, certifying that products comply with specified performance characteristics and physical properties.

## **1.9 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Include accurate as-built drawings.
- .3 Submit two electronic copies and two paper sets of drawings and specifications.
- .4 Manufacturer's installation instructions: submit instructions for installation and operation of products, components, and assemblies.
- .5 Submit operation and maintenance manuals for electrical and electronic equipment. Including details of design elements, component function and maintenance requirements to effectively operate, maintain or repair.
- .6 Include technical data, product data, component illustrations, technical descriptions and parts list, wiring and schematic diagrams not considered proprietary, test and verification reports.

## **1.10 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **1.11 WARRANTY**

- .1 Warranty duration: 12 calendar months following Substantial Completion.
- .2 Coverage: warrant against failure to perform to characteristics as specified.
- .3 Manufacturer's warranty: submit notarized manufacturer's warranty, for Departmental Representative's acceptance.

## **1.12 COMMISSIONING**

- .1 Submit commissioning plan and copies of testing and commissioning documentation in accordance with Sections 01 91 13 - General Commissioning (Cx) Requirements.
- .2 Spot testing will be required for the PALS system immediately after the connections have been completed.

- .3 All the spot tests are to be recorded on a form developed by the contractor and signed off by the CSC ESS representative and the contractor.
- .4 Spot testing will be required for the affected circuit "J". Refer to attached excerpt from the O&M for a list of where existing PSU (antennas) are located.
- .5 The intent is to spot test the existing affected area, being J12, J13, J14, and J15. Refer to the Edmonton Institution PALS Documentation in Appendix A.
- .6 Allow an additional two hours for additional spot testing as directed by the CSC ESS representative.

### **1.13 MATERIALS AND EQUIPMENT**

- .1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Equipment:
  - .1 CSA approved and ULC certified where applicable.
  - .2 Where CSA or ULC designation is not available, obtain approval from local authority having jurisdiction.
- .3 Ensure labels are visible and legible after equipment is installed.
- .4 Factory assemble control panels and component assemblies.

### **1.14 ACCESSORIES**

- .1 Lugs, terminals and screws, used for termination of wiring suitable for conductor materials used.
- .2 Supports: provide anchors and supports for electrical equipment and components. Provide independent supports including fasteners, devices and hangers capable of supporting dead load of equipment and components plus 100 kg. Fibre, wood or plastic inserts are not acceptable.

### **1.15 FINISHES**

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and two coats of finish enamel.
  - .1 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.

## **Part 2 Products**

### **2.1 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and 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 nameplates for control items in English and French.
- .4 Use one nameplate for both languages.

## **2.2 WIRING TERMINATIONS**

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

## **2.3 EQUIPMENT IDENTIFICATION**

- .1 Identify electrical equipment with nameplates as follows:
  - .1 Nameplates: lamicoid 3 mm black face, white core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.
  - .2 Sizes as follows:

| NAMEPLATE SIZES |             |         |                    |
|-----------------|-------------|---------|--------------------|
| Size 1          | 10 x 50 mm  | 1 line  | 3 mm high letters  |
| Size 2          | 12 x 70 mm  | 1 line  | 5 mm high letters  |
| Size 3          | 12 x 70 mm  | 2 lines | 3 mm high letters  |
| Size 4          | 20 x 90 mm  | 1 line  | 8 mm high letters  |
| Size 5          | 20 x 90 mm  | 2 lines | 5 mm high letters  |
| Size 6          | 25 x 100 mm | 1 line  | 12 mm high letters |
| Size 7          | 25 x 100 mm | 2 lines | 6 mm high letters  |
- .2 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .3 Allow for minimum of twenty-five (25) letters per nameplate.
- .4 Identification to be English and French.
- .5 Use one nameplate label for both languages.
- .6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.

## **2.4 WIRING IDENTIFICATION**

- .1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in fire alarm and communication cables, matched throughout system.

## **2.5 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.
 

|   |   |  |
|---|---|--|
| Prime<br>up to 250 V<br>up to 600 V<br>up to 5 kV<br>up to 15 kV<br>Telephone<br>Other Communication Systems<br>Fire Alarm<br>Emergency Voice<br>Other Security Systems<br>PALS | Auxiliary<br>Yellow<br>Yellow<br>Yellow<br>Yellow<br>Green<br>Green<br>Red<br>Red<br>Red<br>Red<br>Match Existing<br>(Purple) | Green<br>Blue<br>Red<br><br>Blue<br>Yellow |
|---|---|--|
- .4 Provide identification of equipment, components, and assemblies specified, using materials suitable to withstand anticipated operating environment.

## **2.6 FIELD QUALITY CONTROL**

- .1 Confirm other related work is complete to receive work of this and related electrical sections.
- .2 Commission electrical systems.
- .3 Qualifications:
  - .1 Electricians: qualified, licensed electricians or apprentices in accordance with Provincial Act respecting manpower vocational training and qualifications.
  - .2 Apprentices: employees registered in provincial apprentices program permitted, under direct supervision of qualified licensed electrician, to perform specific tasks. Permitted activities determined based on level of training attained and demonstration of ability to perform specific duties.
- .4 Contractor holding valid Master Electrical contractor licensed as issued by Province that work is being constructed.

## **Part 3 Execution**

### **3.1 FIELD QUALITY CONTROL**

- .1 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:
  - .1 Materials and resources.
  - .2 Storage and collection of recyclables.
  - .3 Construction waste management.
  - .4 Resource reuse.
  - .5 Recycled content.

.6 Local/regional materials.

.7 Low-emitting materials.

### **3.2 EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for conduit 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.

### **3.3 INSTALLATION**

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

.2 Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, MSDS, and product datasheets.

.3 Protect electrical equipment from dust and dirt. Plug or cap openings in conduit, fixtures and equipment during construction with Departmental Representative approved materials.

.4 Conceal conduit in finished areas, unless otherwise authorized. Run exposed conduit parallel to building lines, and maintain maximum headroom.

.5 Install outlets, plates and other visible items parallel to building lines. Line up exposed raceways, parallel and at right angles to building walls, partitions, and ceilings.

.6 Set equipment and components plumb and level, accurate to position intended, and position hanger rods plumb.

### **3.4 NAMEPLATES AND LABELS**

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

### **3.5 CONDUIT AND CABLE INSTALLATION**

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

### **3.6 LOCATION OF OUTLETS**

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

### **3.7 MOUNTING HEIGHTS**

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

### **3.8 SYSTEM START-UP**

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 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.

### **3.9 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .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 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 05 Common Work Results and Requirements for Electrical
- .2 Section 26 05 29 Hangers & Support for Electrical Systems.
- .3 Section 26 05 31 Splitters, Junction, Pull Boxes and Cabinets.
- .4 Section 26 05 32 Outlet Boxes, Conduit Boxes and Fittings.
- .5 Section 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings

**1.2 PRODUCT DATA**

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

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Packaging Waste Management: remove for reuse and return of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2 Products**

**2.1 BUILDING WIRES**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 14 AWG or as depicted within document packaging.
- .2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RWU90 XLPE and jacketed.

**Part 3 Execution**

**3.1 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform voltage drop/communication tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

**3.2 GENERAL CABLE INSTALLATION**

- .1 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical or as indicated within document packaging.
- .2 Conductor length for parallel feeders to be identical.



- .3 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

### **3.3 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 05 Common Work Results and Requirements for Electrical
- .2 Section 26 05 21 Wire & Cable (0-1000 V).
- .3 Section 26 05 31 Splitters, Junction, Pull Boxes and Cabinets.
- .4 Section 26 05 32 Outlet Boxes, Conduit Boxes and Fittings.
- .5 Section 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings

**1.2 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

**Part 2 Products****2.1 SUPPORT CHANNELS**

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted.

**Part 3 Execution****3.1 INSTALLATION**

- .1 Secure equipment to masonry surfaces with nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Fasten exposed conduit or cables to building construction or support system using straps.
  - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.

- .6 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .7 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .8 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .9 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .10 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 05 Common Work Results and Requirements for Electrical
- .2 Section 26 05 21 Wire & Cable (0-1000 V).
- .3 Section 26 05 29 Hangers and Support for Electrical Systems.
- .4 Section 26 05 32 Outlet Boxes, Conduit Boxes and Fittings.
- .5 Section 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24th Edition.

**1.3 DELIVERY, STORAGE AND HANDLING**

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

**Part 2 Products****2.1 JUNCTION AND PULL BOXES**

- .1 Construction: welded steel enclosure.
- .2 Covers Surface Mounted: screw-on flat covers.

**Part 3 Execution****3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

**3.2 IDENTIFICATION**

- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating system name, or as indicated.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 05 Common Work Results and Requirements for Electrical
- .2 Section 26 05 21 Wire & Cable (0-1000 V).
- .3 Section 26 05 29 Hangers and Support for Electrical Systems.
- .4 Section 26 05 31 Splitters, Junction, Pull Boxes and Cabinets.
- .5 Section 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24th Edition.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2 Products**

**2.1 OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.

**2.2 GALVANIZED STEEL OUTLET BOXES**

- .1 One-piece electro-galvanized construction.
- .2 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

**2.3 FITTINGS - GENERAL**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

**Part 3            Execution**

**3.1                INSTALLATION**

- .1       Support boxes independently of connecting conduits.
- .2       Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3       Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .4       Vacuum clean interior of outlet boxes before installation of wiring devices.
- .5       Identify systems for outlet boxes as required.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 05 Common Work Results and Requirements for Electrical
- .2 Section 26 05 21 Wire & Cable (0-1000 V).
- .3 Section 26 05 29 Hangers & Support for Electrical Systems.
- .4 Section 26 05 31 Splitters, Junction, Pull Boxes and Cabinets.
- .5 Section 26 05 32 Outlet Boxes, Conduit Boxes and Fittings.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA C22.2 No. 18.1-13, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
  - .2 CSA C22.2 No. 83.1-07, Electrical Metallic Tubing.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .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 steel straps to secure surface conduits 50 mm and smaller.
  - .1 Two hole steel straps for conduits larger than 50 mm.

**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.

**2.4 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 in unfinished areas.
- .3 Surface mount conduits where indicated.
- .4 Use electrical metallic tubing (EMT).
- .5 Minimum conduit size for lighting and power circuits: 21 mm.
- .6 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .7 Mechanically bend steel conduit over 21 mm diameter.
- .8 Install fish cord in empty conduits.
- .9 Dry conduits out before installing wire.

**3.3 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Do not pass conduits through structural members except as indicated.
- .3 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

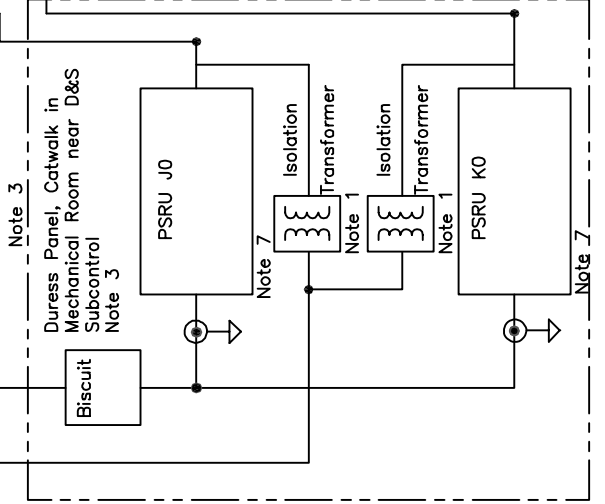
**3.4 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**



**Appendix A**  
**Edmonton Institution PALS Documentation**



1. 120/120VAC, 350 VA isolation transformer mounted within duresse panel or beside PSRU.
2. Dedicated conduit to sensor bank. Do not run AC lines for different PSRU's in the same conduit. Can be routed in star, point-to-point or combination.
3. Duresse Panel — Steel. 24"W X 48"H X 8 5/8"D. Hinged latching cover. Interior mounting plate required. Interconnect with cable tray. Not required for single PSRU in secure area.
4. Install 4 X 4 junction box at all PSU, PSRU and TTU locations. One junction box required per PSRU (DO NOT GANG). Label cover with Breaker # and PALS hardware ID (ie. "PSU 26"). Pull 12 gauge wire into each junction box.
5. Install and label per local and DDC code and specifications.
6. Install all ceiling mount sensors as near as possible to ceiling access panel in specified room. Mount sensor to wall at 12 inches maximum over ceiling.
7. At PSRU and TTU locations, install twistlock receptacle within junction box that is compatible with Leviton 4720C plug and junction box cover. One receptacle per PSRU
8. AFC = Above False (solid) Ceiling;  
ATC = above T—bar Ceiling.



| ZONE | REV | DESCRIPTION | DATE | APPROVED |
|------|-----|-------------|------|----------|
|------|-----|-------------|------|----------|

Kitchen, Paint, Corcan, Maintenance, School, Boiler

|  |             |          |                |               |
|--|-------------|----------|----------------|---------------|
| Edmonton<br>Institution<br>PALS System | SIZE        | FSCM NO. | DWG NO.        | REV           |
|  |             |          | 01-014-07      | As-Built      |
|  | SCALE: NONE |          | DATE: 03-11-02 | SHEET 7 of 11 |

# LIMITED HAZARDOUS MATERIALS ASSESSMENT



**Prepared For:**

Republic Architecture Inc.  
385 St. Mary Avenue  
Winnipeg, MB  
R3C 0N1

**For the Project:**

CSC EI EW038-191019 – Gun Port Replacement R.091022.001  
**CSC Project No.: 539-2702, 539-2703, 539-2704, & 539-3605**  
Edmonton Institution  
21611 Meridian Street  
Edmonton, AB

**Prepared By:**

Cascade Environmental Consulting Ltd.

September 14, 2018

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APPENDIX I..... Site Condition Photographs

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TABLE 1..... Building Description

TABLE 2..... Asbestos-Containing Materials Analysis Results

TABLE 3..... Lead-Based Paint Analysis Results

TABLE 4..... Asbestos-Containing Materials Summary Table

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## **1.0 INTRODUCTION**

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Cascade Environmental Consulting Ltd. (CEC) was retained by Correctional Services Canada (the Client) to conduct a limited hazardous materials assessment throughout select areas of the main catwalk (east and west), as well the upper and lower levels of the D-Block Guard Station and Corridors 102/104 of the Edmonton Institution located at 21611 Meridian Street in Edmonton, Alberta (the Site). This report outlines the findings of the on-site investigation and laboratory analysis of suspected asbestos and lead paint materials located throughout these select areas of the building. The intent of this assessment was to establish general locations of asbestos and lead-based paint materials to facilitate the proposed replacement of various gun ports and windows throughout select areas of main catwalk (east and west), as well the upper and lower levels of the D-Block Guard Station and Corridors 102/104 slated to occur.

The assessment was conducted by Chris Dawn, Environmental Consultant of Cascade Environmental Consulting Ltd. on September 5, 2018.

### **1.1 Scope of Work**

As per the Client's instructions, a limited hazardous materials assessment was performed throughout select areas of main catwalk (east and west), the upper and lower levels of the D-Block Guard Station area and Corridors 102/104. This included laboratory analysis for suspect asbestos-containing materials (ACM) and lead-based paint content samples.

## 2.0 LEGISLATION AND APPLICABLE STANDARDS

The provincial regulations, codes and guidelines relevant to hazardous building materials include the *Alberta Building Code*, *Alberta Occupational Health and Safety Code*, *Alberta Human Resources and Employment*, *Workplace Health and Safety Asbestos Abatement Manual* (2012) and the Federal *Transportation of Dangerous Goods Act* and the *Alberta Environmental Protection and Enhancement Act*.

### 2.1 Asbestos

The *Alberta Building Code*, *Alberta Occupational Health and Safety Code* and *Alberta Human Resources and Employment*, *Workplace Health and Safety Asbestos Abatement Manual* (2012) all comment on asbestos in buildings. *Alberta OHS Code* (2009) outlines the requirements related to asbestos in facilities and outlines the limitations on the use of asbestos in buildings. In summary, asbestos products that have the potential for releasing fibres may not be installed. All materials containing crocidolite and all spray applied asbestos products are banned from use. Asbestos products, in general, must not be in a form or location where they could release airborne fibres and allow them to enter a ventilation system. If asbestos fibres may be released in a building, all necessary steps to correct this unsafe condition must be taken. All materials with the potential of releasing asbestos fibres that may be impacted by a renovation must be encapsulated, enclosed or removed. Any asbestos materials that can release fibres during the demolition must be removed prior to demolition activities.

Historically, materials containing less than 1% asbestos have not been considered “asbestos-containing”. However, recent revisions have removed the definition of an asbestos-containing material. Workers must now comply with asbestos requirements when the material in question contains more than 1% asbestos by weight; or when the material contains less than 1% asbestos but it is known that a “restricted area” is likely to occur (a restricted area is defined as an area of a work site where there is a reasonable chance of the concentration of airborne asbestos exceeding the 8-hour OEL), or when the material contains less than 1% asbestos and there is a reasonable chance that asbestos fibres may be released when the material is disturbed, due to either the condition of the material or the type of work procedures being used. Friable materials such as drywall joint compound and stipple identified as containing less than 1% asbestos may not have been uniformly mixed when applied. These materials could have sections of asbestos in concentrations greater than 1%. When dealing with large quantities of these friable materials, employers need to be aware of these heterogeneous mixtures, making sure to take them into account when developing their asbestos management plan and abatement activities. The employer is responsible to conduct a hazard assessment and evaluate the likelihood of asbestos fibre release based on the material in question and the work procedures being used. **For the purpose of this assessment, materials containing less than 1% asbestos will be considered asbestos-containing.** Asbestos waste is a hazardous material and therefore is governed by the Federal *Transportation of Dangerous Goods Act* and the *Alberta Environmental Protection and Enhancement Act*.

### 2.2 Lead-Based Paint

The *Surface Coating Materials Regulations* (SCMR) made under the *Canada Consumer Product Safety Act* (CCPSA) comments on the concentration of total lead in a surface coating material. The SCMR states that the concentration of total lead in a dried surface coating material may not exceed 90mg/kg (ppm or about 0.009%). Normally lead based paints do not pose a hazard if they are in good condition. Health hazards are created if the paint is delaminating, deteriorating or being disturbed during renovation or demolition activities. Removal techniques such as sanding will cause elevated lead dust levels in the air; while heat guns or flame torches can produce lead fumes. Lead paint can be safely removed if using a chemical stripper while following the proper precautions.

Lead contaminated wastes are considered a hazardous material and therefore its transportation is governed by the federal *Transportation of Dangerous Goods Act*. *The Alberta Users Guide for Waste Managers* (August 1996) under the current *Alberta Environmental Protection and Enhancement Act* require that a Toxic Characteristic Leachate Procedure (TCLP) test is performed on all lead waste before

disposal in a sanitary landfill. The TCLP test will determine the mobility of inorganic analytes present in liquid, solid and multiphasic wastes. If over 5.0 mg/L of lead leaches from the waste material then the waste must be disposed in a Class I landfill as per the Alberta Environmental Protection and Enhancement Act, Waste Control Regulations (Schedule 1, Section 1 (g)(ii)).

### 3.0 METHODOLOGY

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A room by room walkthrough was employed to conduct this hazardous material identification assessment. Representative samples were collected of suspect asbestos-containing materials and suspect lead-based paint samples.

Due to the nature of this hazardous materials assessment, limitations and assumptions were imposed on the work. The assessment was limited to within the areas outlined in the scope of work that have the potential to be impacted by the gun port replacement project.

#### 3.1 Suspect Asbestos Materials

Bulk samples for asbestos content were labeled with the sample number, suspect material description, and sample location. All sample bags were compiled in order and placed into an envelope with a chain of custody form containing the name of the client, date, building number, building location, sample description, sample location, and number of samples and were dispatched to Aspen IAQ Laboratories for analysis. Examination of these samples for asbestos content was conducted in accordance with the current NIOSH Method 9002 (4<sup>th</sup> Edition) the analytical methodology for the analysis of asbestos in buildings using polarized light microscopy (PLM) and dispersion staining optical microscopy. Multiple phases within samples are analyzed separately and then combined to provide the total asbestos content for each sample. Quantification by visual estimate is subjective and may result in a higher degree of error for samples containing low percentages of asbestos. Refer to Appendix II for asbestos sample results.

The *Alberta Asbestos Abatement Manual* (October 2012) recommends a specific number of samples to be collected from suspect ACM depending on the amount present on the site. **Sample quantities were collected according to the *Alberta Asbestos Abatement Manual* (October 2012) recommendations.**

CEC inspected cinder block walls for suspect asbestos-containing wall cavity fill insulation. The inspection was performed by drilling small access holes (one access hole per sample location) into the cinder block throughout the Site.

#### 3.2 Suspect Lead-Based Paint

Representative samples of approximately 1 gram (g) of suspected lead-based paints were collected by scraping a small section of paint. Suspect lead-based paint samples were then deposited and sealed directly into a polyethylene zip-lock bag. All sample bags were compiled in order and placed into an envelope with a chain of custody form containing the name of the client, date, building number, building location, sample description, sample location, and number of samples and were dispatched to Aspen IAQ Laboratories for analysis of total quantity by weight within the paint. Refer to Appendix III for Lead sample results.

**Sufficient amounts of lead-based paint could not be collected for TCLP analysis. The abatement contractor will have to conduct TCLP analysis to determine disposal requirements of any lead-based paint waste.**



## **4.0 LIMITATIONS**

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### **4.1 Asbestos**

Building material finishes were lifted in select areas, however not all finishes were lifted to identify materials beneath. It is possible that asbestos-containing materials may be present under some floor finishes or within concealed spaces such as wall and ceiling cavities; these materials should be considered suspect asbestos-containing materials unless proven otherwise.

Equipment such as exhaust stacks, boilers, kilns, electrical components, mechanical piping and ducting were not dismantled during this assessment. Any internal components and materials should be considered suspect asbestos-containing materials until sampled and proven otherwise.

Laboratory results reflect the sampled materials at the specific sample locations. Materials that were visually similar in colour and texture were referenced to specific analyzed samples and were considered to be of similar composition and were grouped together as one homogeneous material.

The wall cavity behind the corrugated steel wall paneling in the main catwalk (west) could not be accessed during the assessment as significant demolition activities would have been required in order to properly access/investigate behind the paneling.

## 5.0 OBSERVATIONS

**Table 1. Building Description**

| Building Item                            | Details                       |
|--|-------------------------------|
| Building Type/Use                        | Maximum Security Prison       |
| Number of Floors/Levels                  | Two                           |
| Total Floorspace Area (ft <sup>2</sup> ) | Unknown                       |
| Year Constructed/Substantial Renovations | Unknown                       |
| Exterior Cladding                        | N/A                           |
| Roof                                     | N/A                           |
| HVAC                                     | N/A                           |
| Floor Finishes                           | N/A                           |
| Interior Walls                           | Cinderblock / Metal Sheathing |
| Ceilings                                 | Concrete / Drywall            |

### Main Catwalk (West)

The Main Catwalk (West) area includes gun port replacement locations 4, 7, 11, 12, and 14 and overlooks Gym (M). Gun port locations 11, 12, and 14 are built into a corrugated steel wall of the cantilever catwalk, which is built out from the main cinderblock wall of the gym. The wall cavity behind the corrugated steel wall sheathing could not be accessed during the assessment. Given the style of construction, there is likely either no insulation or fiberglass non-asbestos insulation present within the wall cavity. Gun port locations 4 and 7 are built into solid cinderblocks and have drywall ceilings in the adjacent corridor.

The gun ports and their surrounding steel frames are painted brown, while the walls throughout are painted grey.

### Main Catwalk (East)

The Main Catwalk (East) area includes gun port replacement locations 61, 63, 65, 66, 68, 70, 71, 72, 73, 74, and 79 and overlooks Corcan (R) and the Kitchen Area. All gun port locations are built into cinderblocks, which are filled with asbestos-containing vermiculite block wall insulation.

The gun ports, their surrounding steel frames, and the walls and ceilings are painted grey; a bottom layer

of white paint appears to be present. Drywall ceilings are present in all areas.

#### D-Block Guard Unit and Corridors 102/104

The D-Block Guard Unit and Corridors 102/104 areas include gun port replacement locations 20 – 43. The Guard Unit overlooks the split-level floor, with separate windows looking into the upper and lower levels of D-Block. The windows within the guard unit are steel-framed and painted with a light grey paint. A drywall ceiling is present within the guard unit.

The steel-framed windows and doors on the exterior of the guard unit and within Corridors 102/104 are painted with a light blue paint. Black window pane mastic (between the pane and the frame) is present on most window locations. Solid cinderblocks are present within Corridors 102/104.

A photographic library of site conditions observed can be viewed in Appendix I.

## 6.0 FINDINGS

### 6.1 Asbestos

Twenty-three (23) samples of suspected asbestos-containing materials were collected and dispatched for laboratory analysis by Cascade Environmental Consulting Ltd. personnel. **Six (6) of these samples returned containing asbestos.** A summary of asbestos-containing materials can be seen in Table 2. Photographs taken during the assessment are provided in Appendix I. See Appendix II for full laboratory results. A site plan with approximate sample locations is provided in Appendix IV.

**Table 2. Asbestos-Containing Materials Analysis Results**

| Building Material                                  | Sample Number | Asbestos Type and Percent | Sample Location |
|--|---------------|---------------------------|-----------------|
| Vermiculite Block Insulation                       | 1             | <1% Tremolite             | Location 70     |
| Brown Window Frame Mastic (Base b/t Ledge & Frame) | 5             | 1% Chrysotile             | Location 71     |
| Vermiculite Block Insulation                       | 7             | <1% Tremolite             | Location 63     |
| Vermiculite Block Insulation                       | 9             | <1% Tremolite             | Location 78     |
| Black (Painted Blue) Window Pane Mastic            | 14            | <1% Chrysotile            | Location 37     |
| Brown Window Frame Mastic (Base b/t Ledge & Frame) | 18            | 1% Chrysotile             | Location 4      |

### 6.2 Lead-Based Paint

Eleven (11) samples of suspect lead-based paint were sampled throughout select areas of the building. **The samples were tested for lead content and seven (7) returned containing lead content above the current governmental standard of 90 mg/kg.** All delaminating lead containing paint should be removed by a qualified hazardous materials contractor so as to not pose a health hazard from possible dust created. Non delaminating paint is not required to be removed as lead dust will not become airborne. A summary of lead content above government standards are provided in Table 3. Photographs taken during the assessment are provided in Appendix I. See Appendix III for full laboratory results. A site plan with approximate sample locations is provided in Appendix IV.

**Table 3. Lead-Based Paint Analysis Results**

| Sample Number | Location    | Material Description | Lead Content (mg/kg) |
|---------------|-------------|----------------------|----------------------|
| Pb 1          | Location 70 | Grey Wall Paint      | 1410                 |
| Pb 2          | Location 68 | Grey Wall Paint      | 1458                 |

**HAZARDOUS MATERIALS ASSESSMENT**

Edmonton Institution; **CSC Project No.:** 539-2702, 539-2703, 539-2704, & 539-3605  
Edmonton, AB

**September 14, 2018**

Ref:5258HAZ01CD

| <b>Sample Number</b> | <b>Location</b>    | <b>Material Description</b>        | <b>Lead Content<br/>(mg/kg)</b> |
|----------------------|--------------------|------------------------------------|---------------------------------|
| <b>Pb 6</b>          | <b>Location 41</b> | <b>Light Blue Frame Paint</b>      | <b>765</b>                      |
| <b>Pb 7</b>          | <b>Location 43</b> | <b>Light Blue Door/Frame Paint</b> | <b>1629</b>                     |
| <b>Pb 9</b>          | <b>Location 14</b> | <b>Brown Frame Paint</b>           | <b>2504</b>                     |
| <b>Pb 10</b>         | <b>Location 12</b> | <b>Brown Frame Paint</b>           | <b>2802</b>                     |
| <b>Pb 11</b>         | <b>Location 7</b>  | <b>Grey Wall Paint</b>             | <b>2454</b>                     |

## 7.0 RECOMMENDATIONS / DISCUSSION

### 7.1 Asbestos

All asbestos-containing materials identified during the survey are summarized below in Table 4.

**Table 4. Asbestos-Containing Materials Summary Table**

| Sample Number | Building Material                             | Rooms Containing Material                      | Risk Level |
|---------------|---|--|------------|
| 1,7,9         | Vermiculite Block Wall Insulation             | Main Catwalk Walls (East)                      | High       |
| 5,18          | Brown Window Frame Mastic (B/t Frame & Ledge) | Main Catwalk (East & West)                     | Low        |
| 14            | Black (Painted Blue) Window Pane Mastic       | D-Block Guard Unit/Office, Corridors 102 & 104 | Low        |

As outlined in the *Alberta Asbestos Abatement Manual* (October 2012) all asbestos-containing materials can be managed in place in conjunction with an Asbestos Management Plan.

Asbestos-containing materials that may be impacted by demolition or renovation activities must be removed prior to the start of the work. It is recommended that a scope of work be written prior to abatement to scope the complete and proper removal of the identified asbestos-containing materials. Removal should be completed by workers certified by Alberta Human Services, Occupational Health & Safety. Appropriate air monitoring and site inspections should be conducted by qualified personnel throughout the project in order to document that contamination is contained and asbestos-containing materials are removed and disposed of appropriately. Disposal of all asbestos materials is governed by the current *Transportation of Dangerous Goods Act* and the current *Alberta Environmental Protection and Enhancement Act*.

The vermiculite block wall insulation identified within the Main Catwalk (East) cinderblock walls returned from the laboratory as **asbestos-containing**. This material should be removed by a qualified hazardous materials removal contractor following high-risk procedures prior to any renovation/demolition activities, if this material will be disturbed. **This material likely affects window/gun port locations 61, 63, 65, 66, 68, 70 - 74, 78, and 79.**

The brown window frame mastic identified between the frame and the ledge of the windows/gun ports within the Main Catwalk (East & West) returned from the laboratory as **asbestos-containing**. This material should be removed by a qualified hazardous materials removal contractor following low-risk procedures prior to any renovation/demolition activities, if this material will be disturbed. **This material likely affects window/gun port locations 4, 7, 11, 12, 14, 61, 63, 65, 66, 68, 70-74, 78, and 79.**

The black (painted light blue or grey in places) window pane mastic identified between the window panes and frames within the D-Block Guard Unit/Office and Corridors 102 and 104 returned from the laboratory as **asbestos-containing**. This material should be removed by a qualified hazardous materials removal contractor following low-risk procedures prior to any renovation/demolition activities, if this material will be disturbed. **This material likely affects window/gun port locations 20-43.**

### 7.2 Lead-Based Paint

Seven (7) of the paints analyzed returned from the laboratory above the current standard set by SCMR of 90mg/kg and are considered to be lead-based. Any surface painted with the same or similar paint should be assumed to be lead-based. The paints were observed to be in good to fair condition overall. Based on site observations lead paint is assumed to be throughout the main catwalk and D-Block areas, and will be impacted by the gun port replacement scope of work.

**The grey wall paint located throughout the main catwalk east and west, light blue frame paint located within Corridors 102/104 and the exterior side of the D-Block guard room/office, and brown frame paint located on the window ports throughout the main catwalk west are to be considered lead-based.**

*The Alberta Users Guide for Waste Managers (August 1996) under the current Alberta Environmental Protection and Enhancement Act require that a Toxic Characteristic Leachate Procedure (TCLP) test is performed on all lead waste before disposal in a sanitary landfill. The Federal Regulations SOR/2005-149 (Export and Import of Hazardous Waste and Hazardous Recycling Material Regulations) outlines the handling storage and disposal of lead-contaminated materials. The Federal Regulation SOR/2005-149 establishes the regulated limit for disposal of lead-contaminated materials at 5.0 mg/L as determined by using TCLP.*

**Sufficient amounts of lead-based paint could not be collected for TCLP analysis. The abatement contractor will have to conduct TCLP analysis to determine disposal requirements of any lead-based paint waste.**

Lead containing surfaces with any amount of lead that will be impacted by demolition activities in a manner likely to cause some level of airborne lead containing dust or fumes should be controlled through the development and implementation of a written Exposure Control Plan. The exposure control plan should include safe work procedures to address the lead exposure hazard during the maintenance, renovation, or demolition activities. The safe work procedures should include procedures to minimize dust during construction and demolition, procedures for proper containment, collection, clean-up and disposal of debris to prevent contamination in other areas, the use of proper cleaning tools, selection and use of proper personal protective equipment, and other applicable procedures.

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## 8.0 WARRANTY

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Cascade Environmental Consulting Ltd. warrants to the company, organization, or individual to whom this report is addressed that the assessment described in this report has been conducted with a reasonable level of care and skill in accordance with standards currently prevailing in the health, safety, and environmental consulting profession.

The warranty stated above is subject to the following: (a) the investigation described in this report has been limited to the scope of work and budget described in our contract, (b) the testing for, and analysis of, compounds and materials at the site have been limited to those compounds and materials set out in our contract; other compounds or materials not tested for could be present at this site, (c) the investigation described in this report has been made in the context of existing government regulations generally promulgated at the date of this report. The investigation did not account for any government regulations not in effect or not generally promulgated at the date of this report, (d) the collection of samples at this site was consistent with the scope of work described in our contract, and the information obtained concerning prior site use. As conditions between samples may vary, the potential remains for the presence of unknown additional contaminants. The results of conducted testing presented in this investigation described in this report have been limited to the conditions at the time of collection. Should any new information become available, or site work be done, Cascade Environmental Consulting Ltd. should be notified so that we can determine if modifications should be made to this report, and (e) where indicated or implied in this report, or where mandated by the condition of the site and its attendant structures, the conclusions of this report are based on visual observation of the site. The conclusions of this report do not apply to any areas of the site not available for inspection or testing.

This report is intended for the exclusive use of the company, organization or individual to whom it is addressed. It may not be used or relied upon in any manner whatsoever, or for any purpose whatsoever, by any other party. Cascade Environmental Consulting Ltd. makes no representation of fact or opinion of any nature whatsoever to any person or entity other than the company, organization or individual to whom this report is addressed. This warranty stated above may not be assigned.



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## 9.0 CLOSURE

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Respectfully Submitted,

***Cascade Environmental Consulting Ltd.***

**Prepared by:**

Chris Dawn, BSc  
*Environmental Consultant*  
Cascade Environmental Consulting Ltd.  
Ref: 5258HAZ01CD

**Technical Review by:**

Chad McFadyen  
*Project Manager*  
Cascade Environmental Consulting Ltd.

**Final Review by:**

Vic Godbout, CET, CRSP  
*Principal*  
Cascade Environmental Consulting Ltd.

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## 10.0 WORKS CITED

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## APPENDIX I

### SITE CONDITION PHOTOGRAPHS

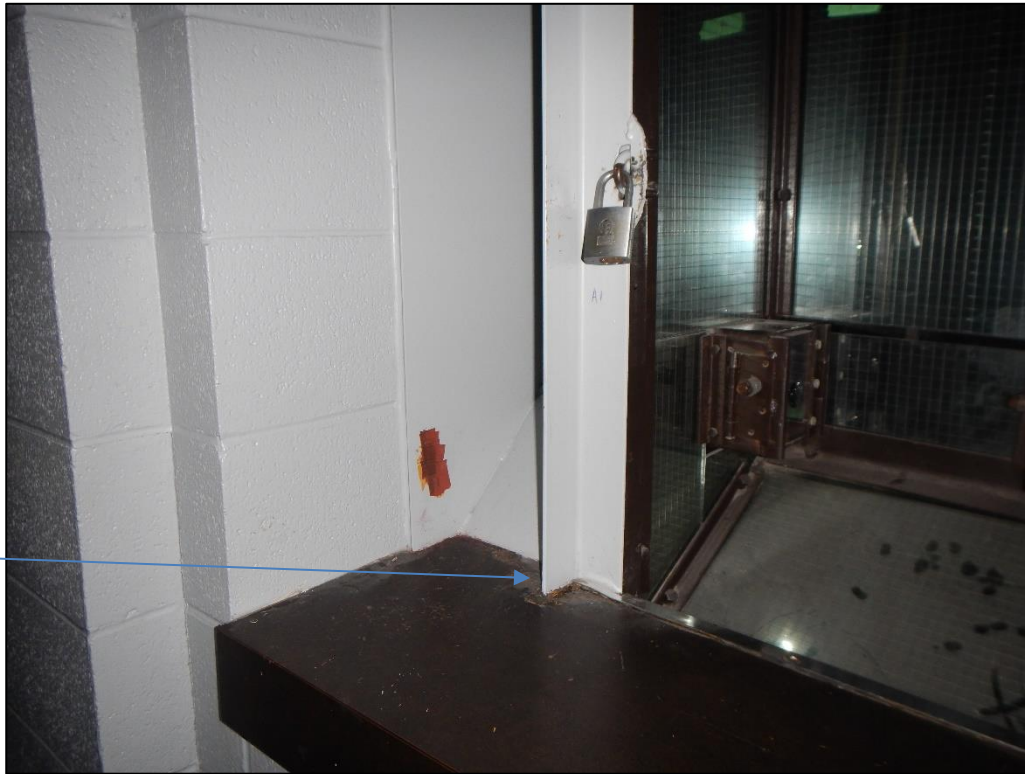
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**Photograph #1:** Asbestos-containing vermiculite block wall insulation in block walls – Main Catwalk (East)



**Photograph #2:** Asbestos-containing brown window frame mastic (b/t frame and ledge) – Main Catwalk (East & West)



**Photograph #3:** Asbestos-containing brown window frame mastic (b/t frame and ledge) – Main Catwalk (East & West)



**Photograph #4:** Asbestos-containing black window pane mastic (b/t pane and frame)  
– D-Block guard unit/office and Corridors 102 & 104





**Photograph #5:** Asbestos-containing black window pane mastic (b/t pane and frame)  
– D-Block guard unit/office and Corridors 102 & 104



**Photograph #6:** Lead-based grey wall paint – Main catwalk (east and west)



**Photograph #7:** Lead-based light blue trim/door paint – Corridors 102 & 104



**Photograph #6:** Lead-based grey wall paint – Main catwalk (east and west)

## APPENDIX II ASBESTOS SAMPLE RESULTS

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**ASPEN** IAQ LABORATORIES

 10061-166 Street, Edmonton, Alberta, T5P 4Y1  
 Ph: 780-488-2325 Fax: 780-488-3019  
 Email: info@aspeniaqlab.ca

**Client:** Cascade Environmental Consulting Ltd.

**Date Sampled:** September 5, 2018

**Project:** 5258

**Date Submitted:** September 5, 2018

**Collected By:** Chris Dawn

**Date Analyzed:** September 10, 2018

**Sample Type:** Asbestos Bulk, Asbestos Identification

**Analyzed By:** Alana Hill, BSc

**Lab ID #:** 7571-23AS

| Sample ID # | Sample # | Description                  | Asbestos Type and Percent | Other Fibres Detected              |
|-------------|----------|------------------------------|---------------------------|------------------------------------|
| Location 70 |          |                              |                           |                                    |
| 7571-01AS   | 1        | Vermiculite Block Insulation | Tremolite <1%             | Cellulose Fibres                   |
| 7571-02AS   | 2        | Brown Window Frame Mastic    | No Asbestos Detected      | Cellulose Fibres, Glass Fibres     |
| 7571-03AS   | 3        | DWJC – Ceiling               | No Asbestos Detected      | Cellulose Fibres, Glass Fibres     |
| Location 71 |          |                              |                           |                                    |
| 7571-04AS   | 4        | Grout                        | No Asbestos Detected      | Cellulose Fibres                   |
| 7571-05AS   | 5        | Brown Window Frame Mastic    | Chrysotile 1%             | Cellulose Fibres, Synthetic Fibres |
| Location 72 |          |                              |                           |                                    |
| 7571-06AS   | 6        | Grout                        | No Asbestos Detected      | Cellulose Fibres                   |
| Location 63 |          |                              |                           |                                    |
| 7571-07AS   | 7        | Vermiculite Block Insulation | Tremolite <1%             | Cellulose Fibres                   |
| Location 74 |          |                              |                           |                                    |
| 7571-08AS   | 8        | DWJC – Ceiling               | No Asbestos Detected      | Cellulose Fibres, Glass Fibres     |
| Location 78 |          |                              |                           |                                    |
| 7571-09AS   | 9        | Vermiculite Block Insulation | Tremolite <1%             | Cellulose Fibres                   |
| Location 26 |          |                              |                           |                                    |
| 7571-10AS   | 10       | DWJC – Ceiling               | No Asbestos Detected      | Cellulose Fibres                   |
| 7571-11AS   | 11       | Black Window Pane Mastic     | No Asbestos Detected      | Cellulose Fibres, Synthetic Fibres |

|  |    |   |                      |   |
|--|----|---|----------------------|---|
| Location 31  |    |   |                      |   |
| 7571-12AS  | 12 | Black Window Pane Mastic                                | No Asbestos Detected | Cellulose Fibres,<br>Synthetic Fibres       |
| Location 40  |    |   |                      |   |
| 7571-13AS  | 13 | Grey Window Pane Mastic                                 | No Asbestos Detected | Cellulose Fibres                            |
| Location 37  |    |   |                      |   |
| 7571-14AS  | 14 | Black (Painted Blue) Window Pane Mastic                 | Chrysotile <1%       | Cellulose Fibres,<br>Glass Fibres           |
| Location 14  |    |   |                      |   |
| 7571-15AS  | 15 | Yellow Frame Mastic (Steel Sheathing)                   | No Asbestos Detected | Cellulose Fibres                            |
| 7571-16AS  | 16 | Black Window Pane Mastic                                | No Asbestos Detected | No Other Fibres Detected                    |
| Location 12  |    |   |                      |   |
| 7571-17AS  | 17 | White Frame Mastic (Between Frame & Sheathing)          | No Asbestos Detected | Cellulose Fibres,<br>Glass Fibres           |
| Location 4   |    |   |                      |   |
| 7571-18AS  | 18 | Brown Frame Mastic (Base Between Ledge & Frame)         | Chrysotile 1%        | Cellulose Fibres,<br>Synthetic Fibres       |
| 7571-19AS  | 19 | Block Mortar  | No Asbestos Detected | Cellulose Fibres                            |
| 7571-23AS  | 23 | DWJC – Ceiling  | No Asbestos Detected | Cellulose Fibres                            |
| Location 7   |    |   |                      |   |
| 7571-20AS  | 20 | Block Mortar  | No Asbestos Detected | Cellulose Fibres                            |
| 7571-21AS  | 21 | DWJC – Ceiling  | No Asbestos Detected | Cellulose Fibres                            |
| 7571-22AS  | 22 | White Ledge Mastic (Between Ledge & Block)              | No Asbestos Detected | No Other Fibres Detected                    |
| <b>Test Method:</b><br>NIOSH Method 9002 (4 <sup>th</sup> Edition)   |    | <b>Methodology:</b><br>Polarized Light Microscopy (PLM) |                      | <b>Quantification:</b><br>Visual Estimation |
| Analysis is conducted in accordance to NIOSH Method 9002, Asbestos (bulk) by PLM. Samples are analyzed utilizing Polarized Light Microscopy with dispersion staining. Asbestos type is identified as Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, or Anthophyllite. The range of measurement is 1% to 100%, with a lower detection limit of <1% asbestos. When the analyst does not identify any asbestos in a sample, it is reported as "No Asbestos Detected." Multiple phases within samples are analyzed separately and then combined to provide the total asbestos content for each sample. Quantification percentages are based on visual estimation. Quantification by visual estimate is subjective and may result in a higher degree of error for samples containing low percentages of asbestos. |    |   |                      |   |
| <b>Comments:</b><br>Samples will be stored in care of Aspen IAQ Laboratories Ltd. for 30 days after the date of submission for analysis. Any storage arrangements after this time are the responsibility of the client. After the 30 days, the samples will be disposed of.  |    |   |                      |   |

## APPENDIX III

### LEAD PAINT SAMPLE RESULTS

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ASPEN IAQ LABORATORIES

10061-166 Street, Edmonton, Alberta, T5P 4Y1

Ph: 780-488-2325 Fax: 780-488-3019

Email: info@aspeniaqlab.ca

**Client:** Cascade Environmental Consulting Ltd.**Date Sampled:** September 5, 2018**Project:** 5258**Date Submitted:** September 5, 2018**Collected By:** Chris Dawn**Date Analyzed:** September 11, 2018**Sample Type:** Bulk Paint, Lead Content**Analyzed By:** Alana Hill, BSc**Lab ID #:** 7571-11PB

| Sample ID # | Sample # | Description                               | Lead Content (mg/kg) |
|-------------|----------|---|----------------------|
| 7571-01PB   | 1        | Grey Wall Paint – Location 70             | 1410                 |
| 7571-02PB   | 2        | Grey Wall Paint – Location 68             | 1458                 |
| 7571-03PB   | 3        | Grey Wall Paint (Block) – Location 73     | 16                   |
| 7571-04PB   | 4        | Grey Window Frame Paint – Location 29     | 64                   |
| 7571-05PB   | 5        | Grey Window Frame Paint – Location 33     | 47                   |
| 7571-06PB   | 6        | Light Blue Frame Paint – Location 41      | 765                  |
| 7571-07PB   | 7        | Light Blue Door/Frame Paint – Location 43 | 1629                 |
| 7571-08PB   | 8        | Light Blue Frame Paint – Location 37      | 59                   |
| 7571-09PB   | 9        | Brown Frame Paint – Location 14           | 2504                 |
| 7571-10PB   | 10       | Brown Frame Paint – Location 12           | 2802                 |
| 7571-11PB   | 11       | Grey Wall Paint – Location 7              | 2454                 |

**Test Method:** EPA Method 7420/NIOSH Method 7082 (Modified)    **Methodology:** Flame Atomic Absorption Spectrometry

Quality Control Check – Certified Reference Material

Result: 99% Acceptable Range: 80-120%

Quality Control Check – Internal QC

Result: 98% Acceptable Range: 80-120%

Quality Control Check – Method Blank

Result: <10 mg/kg Limit: 10 mg/kg

Analysis method is modified from EPA Method 7420, Lead (Atomic Absorption, Direct Aspiration) and NIOSH Method 7082 (Lead by Flame AAS). Samples are analyzed utilizing Flame Atomic Absorption Spectrometry (FAAS). The instrument detection limit is 0.02 ppm and the method detection limit is 10 mg/kg for digested solids.

**Comments:**

*Samples will be stored in care of Aspen IAQ Laboratories Ltd. for 30 days after the date of submission for analysis. Any storage arrangements after this time are the responsibility of the client. After the 30 days the samples will be disposed of.*

## APPENDIX IV SAMPLE LOCATION DRAWINGS

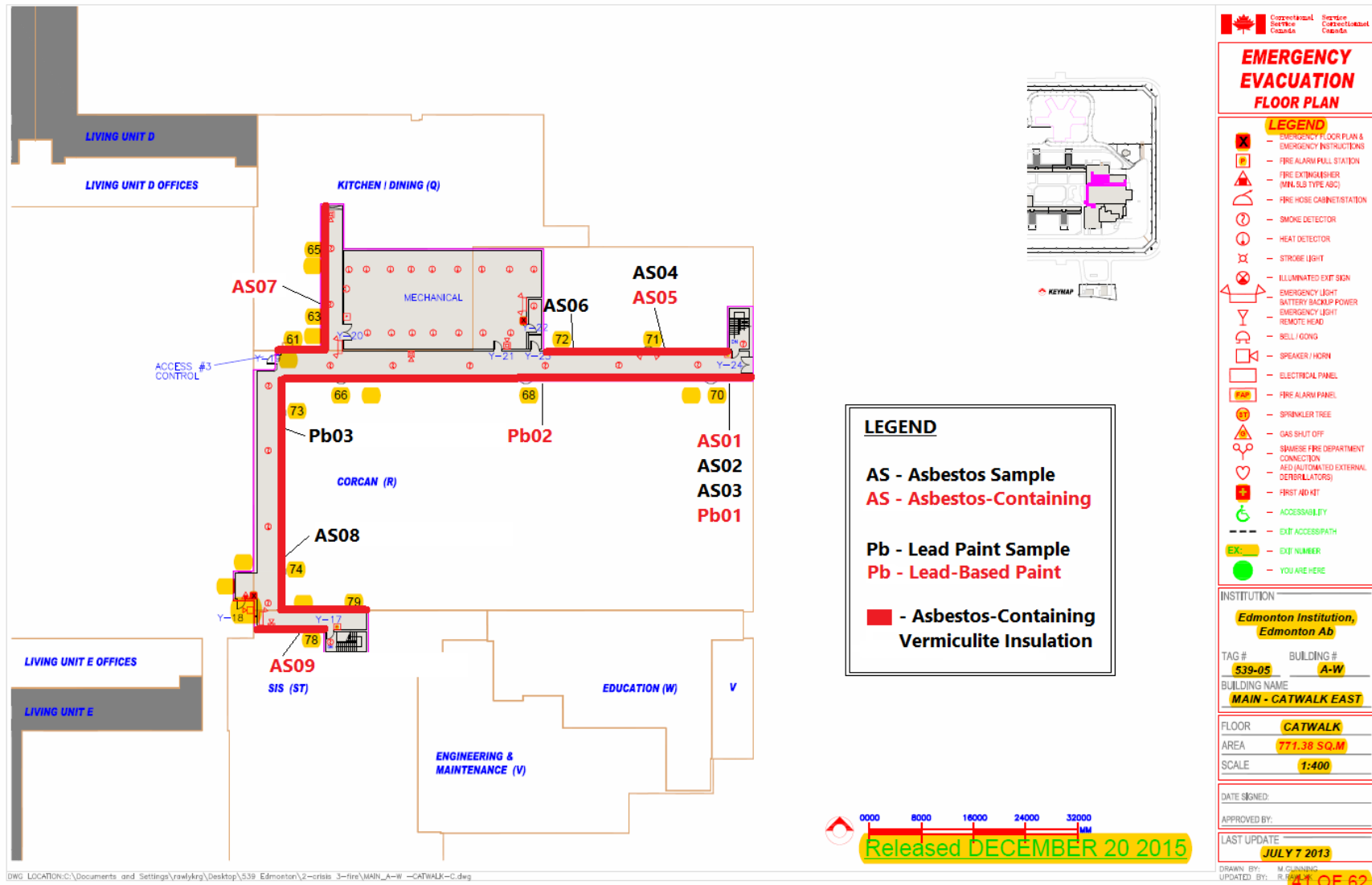
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# HAZARDOUS MATERIALS ASSESSMENT

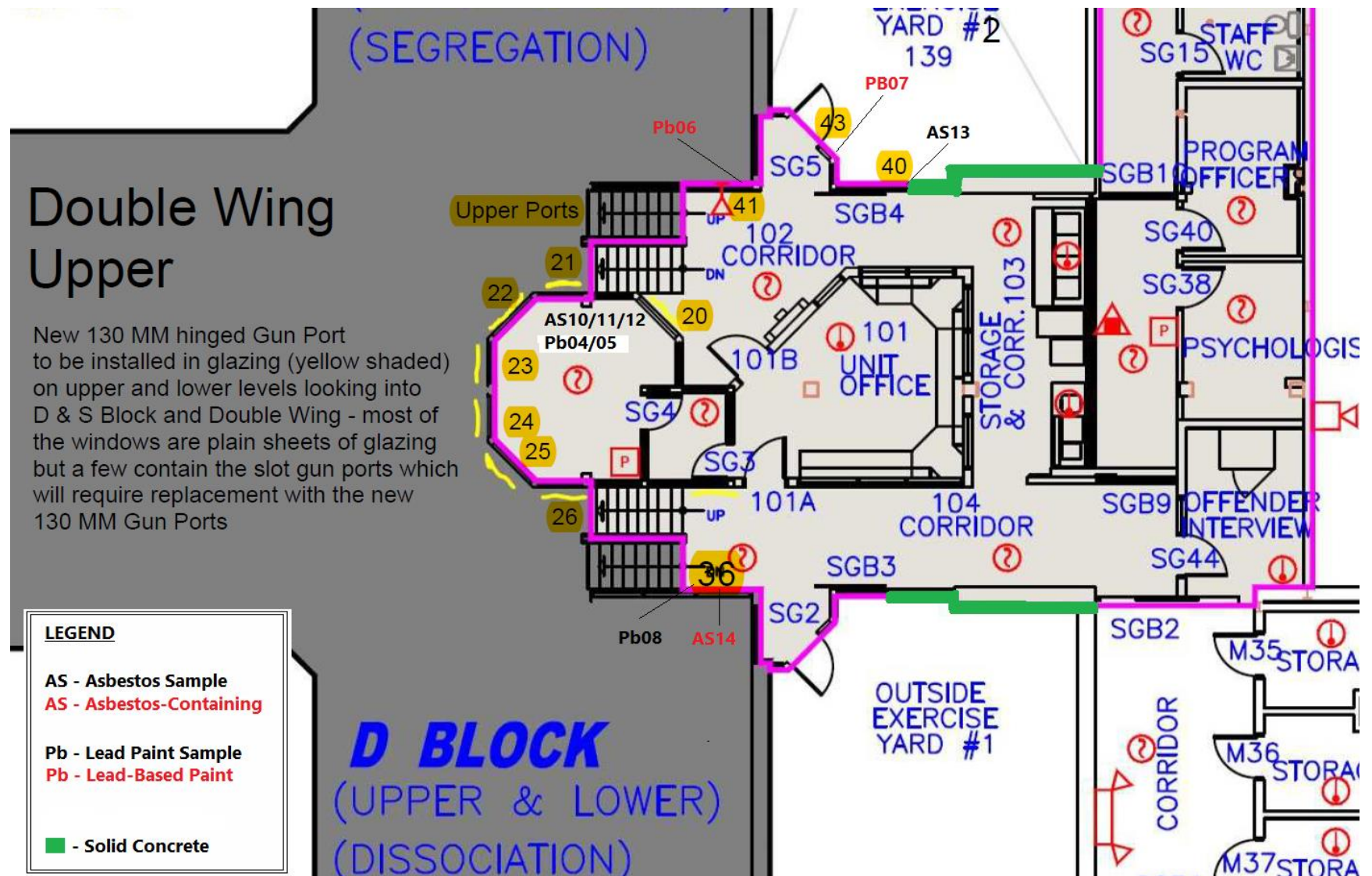
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Edmonton, AB

September 14, 2018

Ref:5258HAZ01CD







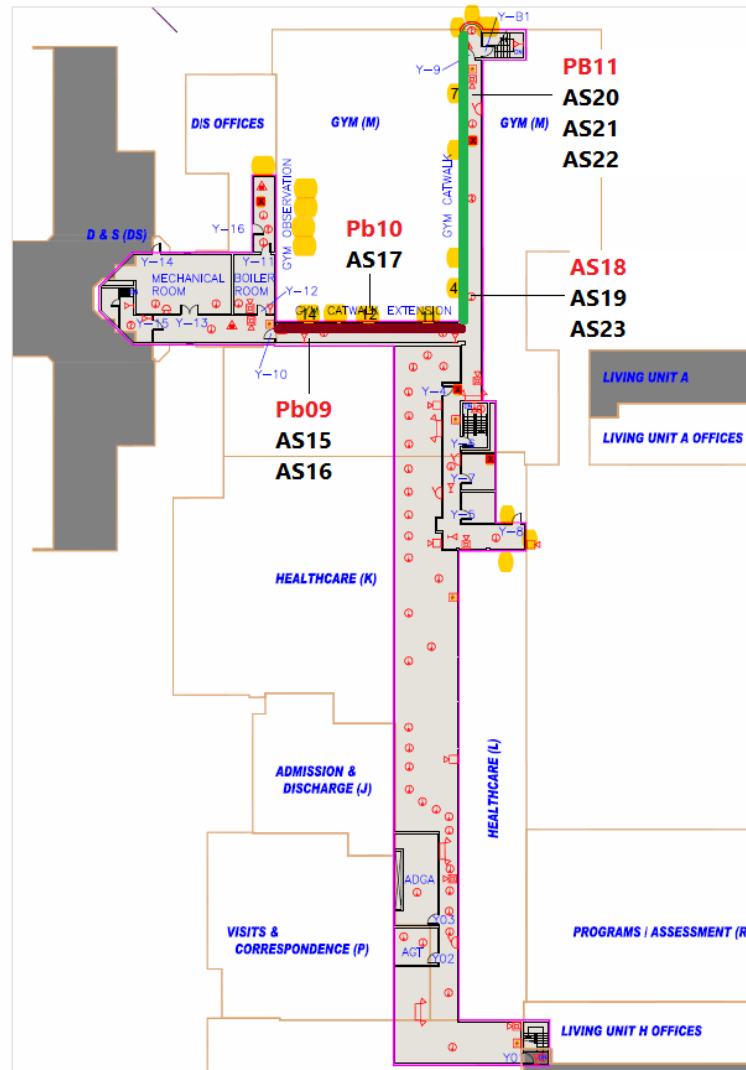


# HAZARDOUS MATERIALS ASSESSMENT

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Edmonton, AB

September 14, 2018

Ref:5258HAZ01CD

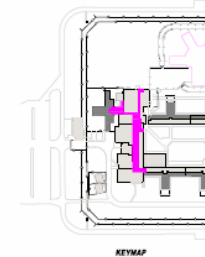


## LEGEND

AS - Asbestos Sample  
AS - Asbestos-Containing

Pb - Lead Paint Sample  
Pb - Lead-Based Paint

■ - Metal Cladding  
■ - Solid Concrete



Released DECEMBER 20 2015



## EMERGENCY EVACUATION FLOOR PLAN

### LEGEND

- EMERGENCY FLOOR PLAN & EMERGENCY INSTRUCTIONS
- FIRE ALARM PULL STATION
- FIRE EXTINGUISHER (MIN. 4.5 TYPE ABC)
- FIRE HOSE CABINET/STATION
- SMOKE DETECTOR
- HEAT DETECTOR
- STROBE LIGHT
- ILLUMINATED EXIT SIGN
- EMERGENCY LIGHT BATTERY BACKUP POWER
- EMERGENCY LIGHT REMOTE HEAD
- BELL / GONG
- SPEAKER / HORN
- ELECTRICAL PANEL
- FIRE ALARM PANEL
- SPRINKLER TREE
- GAS SHUT OFF
- SWAP FIRE DEPARTMENT CONNECTION AND AUTOMATED EXTERNAL DEBRILLATORS
- FIRST AID KIT
- ACCESSIBILITY
- EXIT ACCESS PATH
- EX: — EXIT NUMBER
- YOU ARE HERE

INSTITUTION  
**Edmonton Institution,  
Edmonton Ab**

TAG # **539-05** BUILDING # **A-W**  
BUILDING NAME  
**MAIN - CATWALK WEST**

FLOOR **CATWALK**  
AREA **873.23 SQ.M**  
SCALE **1:400**

DATE SIGNED:

APPROVED BY:

LAST UPDATE  
**JULY 7 2013**

DRAWN BY: M. GUNNING  
UPDATED BY: J. RAY

40 OF 62