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PACKAGE B:
THIS PACKAGE CONTAINS A SECURITY REQUIREMENT

Specifications | Devis

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DND Project File : 500613544

DCC Project File : KN229981

Drawing Number | Numéro du projet : K-K74-7701/32

Date | Date : 2026-03-30

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Part 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 demolition and disposal of select building and site items

.2 removal and reinstallation of select building items

.3 repair and restoration work after completion of work of this section

1.2 RELATED REQUIREMENTS

.1 Section 26 05 05 – Selective Demolition for Electrical

1.3 DEFINITIONS

.1 Hazardous Materials: Products, mixtures, materials, or substances classified as physical hazards or health hazards in accordance with Schedule 2 of the Hazardous Products Act.

1.4 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CSA Z783:12, Deconstruction of Buildings and Their Related Parts

.2 Health Canada (HC):

.1 R.S.C. 1985, c H-3, Hazardous Products Act

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Coordinate work of this section with:

.1 Divisions 21, 26, and 28 for specific demolition requirements related to mechanical and electrical services.

.2 Pre-Demolition Meetings: Prior to each new phase, conduct site meeting in accordance with 01 11 00 General Instructions, sand attended by the DCC Representative, and related Subcontractors to:

.1 Verify project requirements, including existing construction conditions affected by work of this section, scope of selective demolition work, demolition sequencing, and protection of in-place conditions.

.2 Review scheduling of utility disruptions that may affect building occupants.

.3 Coordinate with other Subcontractors.

.3 Scheduling:

.1 Maintain project schedule in accordance with 01 11 00 General Requirements, without compromising specified minimum material diversion rates.

.2 Notify the DCC Representative of unforeseen delays, in writing.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit the following action submittals before starting work of this section:

.1 Schedule of Demolition Activities: in accordance with Section 01 32 16.19 – Construction Progress Schedule-Bar (Gantt) Chart and Section 01 11 00 General Instructions.

.3 Submit copies of the following, when required by the authority having jurisdiction (AHJ):

.1 reviewed Shop Drawings;

.2 reviewed demolition procedures.

1.7 QUALITY ASSURANCE

.1 Licensed Professional Qualifications: In accordance with Div 01.

1.8 SITE CONDITIONS

.1 Hazardous Materials are expected to be encountered in the Work.

.2 Review the hazardous materials assessment "Project Specific Designated Substances and Hazardous Materials Survey – Component 2, Task 1: Comprehensive Survey for Life Safety Upgrades Throughout R13" (March 6, 2025)

.3 DND will remove Hazardous Materials before the start of the Work.

Part 2 PRODUCTS

2.1 MATERIAL OWNERSHIP

.1 Coordinate material ownership with DCC Representative.

.1 DND will retain ownership of:

.1 items to remain;

.2 items to be re-used;

.3 items to be re-installed;

.4 items to be removed and turned over to the DCC Representative;

.5 historic items, relics, and similar objects;

.6 cornerstones and their contents;

.7 commemorative plaques and tablets;

.8 antiques;

.9 other items of interest or value to the DCC Representative that may be encountered during demolition.

.2 Take possession of demolished materials and remove from site.

2.2 REPAIR MATERIALS

.1 Use repair materials identical to existing materials.

.1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces as closely as possible.

.2 Use materials whose installed performance equals or surpasses that of existing materials.

.3 Comply with material and installation requirements specified in:

.1 Section 07 84 00 Firestopping

.2 Section 07 92 00 Joint Sealants

.3 Section 09 21 16 Gypsum Board Assemblies

.4 Section 09 51 13 Acoustical Panel Ceilings

.5 Section 09 91 00.08 Painting for Minor Works

.6 Divisions 21, 26, 28, 31

Part 3 EXECUTION

3.1 EXAMINATION

.1 Review existing conditions and coordinate with indicated requirements to determine extent of demolition required.

.2 Review record documents of existing facility available from the DCC Representative.

.3 DCC Representative does not guarantee record documents are accurate, complete, or appropriate.

.4 When unforeseen structural, mechanical, electrical, or other issues are encountered that interfere with demolition or removal, investigate and measure the nature and extent of the interference.

.5 Promptly submit a written report to the DCC Representative.

.6 Perform an engineering review of building conditions to determine whether removing any element might result in structural deficiency, deformation, or unplanned collapse of any portion of the building or structure, or adjacent buildings or structures, during demolition operations.

.7 Verify Hazardous Materials have been abated or remediated before proceeding with work of this section.

3.2 PREPARATION

.1 Protection of In-Place Conditions:

.1 Use methods, certified by a qualified licensed engineer to prevent movement, settlement, or damage to adjacent properties and buildings, structures, utilities, landscaping, parts of building to remain in place. Provide temporary bracing and shoring as required.

.2 Minimize noise, dust, vibration, and inconvenience to occupants in accordance with Section 01 14 00 – Work Restrictions. Provide temporary negative air pressure in demolition areas relative to adjacent occupied areas.

.3 Protect building systems, utilities, equipment, landscaping, and other items to remain.

.4 Provide temporary dust screens, covers, railings, supports, and other protection in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

.5 Maintain access to egress, walkways, corridors, exits, and other adjacent occupied or partially-occupied facilities, unless approved, in writing, by the AHJ.

.1 Submit copy of written approval from the AHJ.

.6 (Reserved)

3.3 DEMOLITION AND REMOVAL REQUIREMENTS

.1 Demolish or remove select building items in accordance with CSA Z783.

3.4 DEMOLITION

.1 Demolish items as indicated on the Drawings and as required to facilitate new construction.

.1 Trim edges of partially demolished building materials to suit future use.

.2 Use methods to minimize dust, such as wetting dust-producing materials.

.3 Leave Work in safe and stable condition at end of each Working Day.

.4 Dispose of demolished items off site. Comply with hauling and disposal regulations of AHJ.

3.5 REMOVE AND REINSTALL

.1 Remove items indicated on the Drawings.

.2 Examine removed items. Confirm DCC Representative's acceptance for reinstallation if removed items appear in poor condition.

.3 Temporarily store, protect, and prepare removed items for re-use.

.4 Reinstall removed items as indicated on the Drawings.

3.6 REPAIRS AND RESTORATION

.1 Promptly repair damage to adjacent construction caused by work of this section. Patch existing surfaces to make suitable for new materials.

.2 Restore exposed finishes on patched surfaces. Extend restoration to adjoining construction to eliminate evidence of patching and refinishing.

.3 Below-Grade Areas: Rough grade below-grade areas. Make ready for subsequent excavation or new construction.

.4 Below-Grade Areas: Completely fill below-grade areas and voids caused by work of this section. Use satisfactory soil materials according to backfill requirements in section 31 23 33.01 Excavating, Trenching and Backfilling.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Comply with requirements of this Section when performing following work:

.1 Removal of non-friable asbestos-containing material if the material is removed by breaking, cutting, drilling, abrading, grinding or vibrating, if the material is wetted to control the spread of dust and fibres, and the work is only done by means of non-powered hand-held tools.

.2 Refer to the Specification Section 01 14 25 – Designated Substances, for details on asbestos-containing materials.

1.2 RELATED SECTIONS

.1 Section 01 14 25 – Designated Substances

.2 Section 02 82 00.02 – Asbestos Abatement: Moderate Risk Precautions

.3 Section 02 82 00.03 – Asbestos Abatement: High Risk Precautions

.4 Section 02 83 00 – Lead Precautionary Measures

.5 Section 02 89 00 – Silica Precautionary Measures

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-1.205-03, Sealer for Application of Asbestos-Fibre Releasing Materials.

.2 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act, 1999 (CEPA).

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Safety Data Sheets (SDS).

.4 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.5 Underwriters' Laboratories of Canada (ULC).

.6 Canada Labour Code Part II, Section 124 and 125.

.1 Canada Occupational Health and Safety Regulations

.7 DND Asbestos Management Directive

.8 Ontario Dangerous Goods Transportation Act

.9 *Ontario Environmental Protection Act, R.R.O 1990,*

.1 General – Waste Management, O. Reg 347/90, as amended.

.10 National Joint Council (NJC).

.1 Part XI – Hazardous Substances.

.11 Ontario Ministry of Labour, Immigration, Training and Skills Development (MLITSD).

.1 Occupational Health and Safety Act, R.S.O 1990, c. O1 (OSHA)

.1 O.Reg. 278/05 – Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations, as amended

.2 Ontario Occupational Health and Safety Act, R.S.O. 1990, Regulation 490/09 "Designated Substances", as amended.

.3 O.Reg 213/91 - "Construction Projects", as amended.

1.4 DEFINITIONS

.1 HEPA vacuum: DOP tested High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.2 Amended Water: water with non-ionic surfactant wetting agent added to reduce surface tension of water to allow thorough wetting of fibres.

.3 Asbestos-Containing Materials (ACMs): materials that contain 0.5 percent or more asbestos by dry weight, identified under Existing Conditions including fallen materials and settled dust.

.4 Asbestos Work Area: area where work takes place which will, or may, disturb ACMs.

.5 Authorized Visitors: Departmental Representative, and representative(s) of regulatory agencies.

.6 Competent worker: in relation to specific work, means a worker who:

.1 Is qualified because of knowledge, training and experience to perform the asbestos work.
.2 Is familiar with the provincial laws and with the provisions of the regulations that apply to the work.
.3 Has knowledge of all potential or actual danger to health or safety in the work.

.7 Hazardous Material Workplan: A brief report identifying the location and quantities of hazardous materials and the methods that will be used to remove, store, transport and dispose of them.

.8 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.9 Occupied Area: any area of the building or work site that is outside Asbestos Work Area.

.10 Polyethylene: rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

.11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Sprayer must have appropriate capacity for work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit proof satisfactory to the Departmental Representative that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.

.2 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.

.3 Submit to the Departmental Representative necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.

.4 Submit proof (certificate) that all asbestos workers and/or supervisor have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.

.5 Submit proof satisfactory to Departmental Representative that employees have appropriate respirator fitting and testing (fit test certificates). Workers must be fit-tested (qualitative as a minimum) with respirator that is personally issued.

.6 Asbestos abatement section within Hazardous Material Work Plan.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial, 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:

Safety Requirements: worker protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.1 As a minimum, air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable-type protective clothing (high-density polyethylene protective clothing (as approved by Departmental Representative) that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn

by every worker who enters the work area, and the protective clothing shall consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing to include suitable footwear, and to be repaired or replaced if torn.

.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 their 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.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Remove all packaging materials from site and return to appropriate recycling facilities.

.2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Separate for reuse, and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers. Location and transportation of all on-site waste containers must be approved by Departmental Representative in writing prior to work.

.5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.6 Fold up metal banding, flatten and place in designated area for recycling.

.7 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 0.15 mm thick bags or leak proof drums. Label containers with appropriate warning labels.

.8 Provide waste manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial. All waste landfill manifests are to be provided to the Departmental Representative at the end of the project.

1.8 EXISTING CONDITIONS

.1 Refer to the Specification Section 01 14 25 – Designated Substances for details on materials containing asbestos.

.2 Notify Departmental Representative of asbestos-containing 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.

1.9 SCHEDULING

.1 Hours of Work: perform work involving asbestos abatement located at the Building during hours specified by Departmental Representative. **The work schedule must be approved in writing by the Departmental Representative in advance of work.** Contractor shall be available to work continuously from beginning to end of project.

1.10 PERSONNEL TRAINING

.1 Before beginning Work, provide Departmental Representative with 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.

Part 2 Products

2.1 MATERIALS

.1 Drop Sheets:

.1 Polyethylene: 0.15 mm thick.

.2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.

.2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting of asbestos-containing material.

.3 Waste Containers: contain waste in two separate containers.

.1 Inner container: 0.15 mm thick sealable polyethylene waste bag.

.2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.

.3 Labelling requirements: affix preprinted cautionary asbestos warning in both official languages that is visible when ready for removal to disposal site.

Part 3 Execution

3.1 SUPERVISION

.1 Minimum of one Supervisor for every ten workers is required inside the asbestos work areas at all times.

.2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos-containing materials.

3.2 PROCEDURES

.1 Before beginning Work, isolate Asbestos Work Area using, at a minimum, preprinted cautionary asbestos warning signs in both official languages that are visible at access routes to Asbestos Work Area.

.1 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work.

.2 Use HEPA vacuum, or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.

.3 Do not use compressed air to clean up or remove dust from any surface.

.2 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.

.1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in Asbestos Work Area where dust and contamination cannot otherwise be safely contained.

.3 Wet materials containing asbestos to be cut, ground, abraded, scraped, drilled, or otherwise disturbed unless wetting creates hazard or causes damage. If materials cannot be wetted, then more stringent risk precautions may be required (e.g., Moderate or High Risk).

.1 Use garden reservoir type low - velocity fine - mist sprayer.

.2 Perform Work to reduce dust creation to lowest levels practicable.

.3 Work will be subject to visual inspection.

.4 Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.4 Clean-Up:

.1 Frequently during Work and immediately after completion of Work, clean up dust and asbestos-containing waste using HEPA vacuum or by damp mopping.

.2 Place dust and asbestos-containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste; wet and fold these items to contain dust, then place in plastic bags.

.3 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.

.4 Seal waste bags and remove from site. Dispose of in accordance with requirements of Provincial and Federal Authority having jurisdiction.

Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.

.5 Perform final thorough clean-up of Work areas and adjacent areas affected by Work using HEPA vacuum.

3.3 INSPECTION

.1 Perform inspection of Asbestos Work Area to confirm compliance with specification and governing authority requirements. Deviation(s) from these requirements that have not been approved in writing by Departmental Representative may result in Work stoppage, at no cost to the Departmental Representative.

.2 Departmental Representative may inspect Work at any time during the project 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 When asbestos leakage from Asbestos Work Area has occurred or is likely to occur Departmental Representative may order Work shutdown.

.4 No additional costs will be allowed by the Contractor for additional labour or materials required to provide specified performance level.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Comply with requirements of this Section when performing the following work:

.1 The breaking, cutting, drilling, abrading, grinding, sanding, or vibrating of asbestos-containing materials if the work is done by means of a power tool that is attached to a dust-collecting device equipped with HEPA filters.

.2 Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if,

.1 The material is not wetted to control the spread of dust or fibres, and

.2 The work is done only by means of non-powered hand-held tools.

.2 Refer to Section 01 14 25 – Designated Substances for details on asbestos-containing materials

1.2 RELATED SECTIONS

.1 Section 01 14 25 – Designated Substances

.2 Section 02 82 00.01 – Asbestos Abatement: Low-Risk Precautions

.3 Section 02 82 00.03 – Asbestos Abatement: High-Risk Precautions

.4 Section 02 83 00 – Lead Precautionary Measures

.5 Section 02 89 00 – Silica Precautionary Measures

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-1.205-03, Sealer for Application of Asbestos-Fibre Releasing Materials.

.2 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act, 1999 (CEPA).

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Safety Data Sheets (SDS).

.4 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.5 Underwriters' Laboratories of Canada (ULC).

.6 DND Asbestos Management Directive

.7 Canada Labour Code Part II, Section 124 and 125.

.1 Canada Occupational Health and Safety Regulations

.8 Ontario Dangerous Goods Transportation Act

.9 *Ontario Environmental Protection Act, R.R.O 1990,*

.1 General – Waste Management, O. Reg 347/90, as amended.

.10 National Joint Council (NJC).

.1 Part XI – Hazardous Substances.

.11 Ontario Ministry of Labour, Immigration, Training and Skills Development (MLITSD).

.1 Occupational Health and Safety Act, R.S.O 1990, c. O1 (OSHA)

.1 O.Reg. 278/05 – Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations, as amended.

.2 Ontario Occupational Health and Safety Act, R.S.O. 1990, Regulation 490/09 "Designated Substances", as amended.

.3 O.Reg 213/91 - "Construction Projects", as amended.

1.4 DEFINITIONS

.1 Amended Water: water with non-ionic surfactant wetting agent added to reduce surface tension of water to allow wetting of fibres.

.2 Asbestos-Containing Materials (ACMs): materials that contain 0.5 percent or more asbestos by dry weight, identified under Existing Conditions Article, including fallen materials and settled dust.

.3 Asbestos Work Area: area where work takes place which will or may disturb ACMs.

.4 Authorized Visitors: Departmental Representative, and representative(s) of regulatory agencies.

.5 Competent worker: in relation to specific work, means a worker who:

.1 Is qualified because of knowledge, training and experience to perform the asbestos work.
.2 Is familiar with the provincial laws and with the provisions of the regulations that apply to the work.
.3 Has knowledge of all potential or actual danger to health or safety in the work.

.6 Curtained doorway: arrangement of closures to allow ingress or egress from one room to another while permitting minimal air movement between rooms, typically constructed as follows:

.1 Place two overlapping sheets of polyethylene over existing or temporarily framed doorway, secure each along top of doorway, secure vertical edge of one sheet along one vertical side of doorway, and secure vertical edge of other sheet along opposite vertical side of doorway.

.2 Reinforce free edges of polyethylene with duct tape and weight bottom edge to ensure proper closing.

.3 Overlap each polyethylene sheet at openings not less than 1.5 metres on each side.

.7 DOP Test: testing method used to determine integrity of Negative Pressure unit using Dispersed Oil Particulate (DOP) HEPA-filter leak test.

.8 Friable Material: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

.9 Hazardous Material Workplan: A brief report identifying the location and quantities of hazardous materials and the methods that will be used to remove, store, transport and dispose of them.

.10 HEPA vacuum: DOP tested, High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.

.11 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.12 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.

.13 Occupied Area: any area of building or work site that is outside Asbestos Work Area.

.14 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for scope of work.

1.5 ACTION AND INFORMATION SUBMITTALS

.1 Submit proof satisfactory to the Departmental Representative that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.

.2 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.

.3 Submit to the Departmental Representative necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.

.4 Submit proof that all asbestos workers and/or supervisor have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.

.5 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Departmental Representative. Minimum of one supervisor for every ten workers.

.6 Submit Worker's Compensation Board status and transcription of insurance.

.7 Submit documentation including test results, fire and flammability data, and Safety Data Sheets (SDS) for chemicals or materials including:

.1 encapsulants;

.2 amended water;

.3 slow-drying sealer.

.8 Submit proof satisfactory to Departmental Representative that employees have appropriate respirator fitting and testing (fit test certificates). Workers must be fit tested (qualitative as a minimum for Half-face respirator, quantitative for Full-face respirator) with respirator that is personally issued.

.9 Asbestos abatement section within Hazardous Material Work Plan.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial 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 the time work is performed.

.2 Health and Safety:

.1 Safety Requirements: worker and visitor protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.1 As a minimum, air purifying respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial (Ontario) Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable-type protective clothing (high-density polyethylene protective clothing (as approved by the Departmental Representative) that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing shall consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing to include suitable footwear, and to be repaired or replaced if torn.

.3 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.4 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.

.5 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing hands and face shall be provided within or close to the 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.

.7 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.

.2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Separate for reuse, and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.6 Fold up metal banding, flatten and place in designated area for recycling.

.7 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 0.15 mm thick bags or leak proof drums. Label containers with appropriate warning labels.

.8 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

1.8 EXISTING CONDITIONS

.1 Refer to the Specification Section 01 14 25 – Designated Substances for details on asbestos-containing materials.

.2 Notify Departmental Representative of asbestos-containing 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.

1.9 SCHEDULING

.1 Hours of Work: perform work involving asbestos abatement located at the Building during hours specified by Departmental Representative **The work schedule must**

be approved in writing by the Departmental Representative in advance of work. Contractor shall be available to work continuously from beginning to end of project.

PERSONNEL TRAINING

1.10

.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 asbestos and respirators includes, at minimum:

- .1 the employer's general obligations;
- .2 the effects of asbestos on health;
- .3 the standards applicable and the sampling to be carried out;
- .4 the worker's rights and obligations;
- .5 individual and common protective devices and equipment;
- .6 the tasks to be carried out and the equipment and tools to be used;
- .7 safe working methods and procedures;
- .8 prevention and verification methods.
- .9 Adjusting respiratory masks;
- .10 Inspection and maintenance of equipment;
- .11 Disinfection of equipment;
- .12 Restrictions on the use of materials.

.3 Instruction and training must be provided by competent, qualified person.

Part 2 Products

2.1 MATERIALS

.1 Drop and Enclosure Sheets.

- .1 Polyethylene: 0.15 mm thick.
- .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.

.2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in concentration to provide thorough wetting of asbestos-containing material.

.3 Waste Containers: contain waste in two separate containers.

- .1 Inner container: 0.15 mm thick sealable polyethylene bag
- .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
- .3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site.

.4 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.

.5 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 asbestos fibres.

.1 Sealer: flame spread and smoke developed rating less than 50.

.6 Encapsulant: penetrating type conforming to CAN/CGSB-1.205.

Part 3 Execution

3.1 SUPERVISION

.1 Minimum of one Supervisor for every ten workers is required.

.2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos-containing materials.

3.2 PROCEDURES

.1 Build a one (1) chambered Equipment/Access Room between entrance and work area(s), with two curtained doorways. Build equipment/access room large enough for at least one worker allowing him /her sufficient space to undress comfortably.

.2 Before beginning Work, at each access to Asbestos Work Area, install warning signs in both official languages in upper case "Helvetica Medium" letters reading as follows where number in parentheses indicates font size to be used: "ASBESTOS (50 mm) DANGER (40 mm) Do not breathe dust (15 mm) Protective equipment must be worn (15mm), No admittance (15 mm) Inhaling asbestos dust may be harmful to your health (10mm)".

.3 Before beginning Work remove visible dust from surfaces in work area where dust is likely to be disturbed during course of work.

.1 Use HEPA vacuum, or damp cloths where damp cleaning does not create hazard and is otherwise appropriate.

.2 Do not use compressed air to clean up or remove dust from any surface.

.4 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.

.1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in work areas where dust or contamination cannot otherwise be safely contained.

.2 Erect enclosure of polyethylene sheeting around indoor moderate risk work areas, establish clean room at entrance to enclosure, shut off mechanical ventilation system serving work area, and seal ventilation ducts to and from work area.

.3 Remove loose material by HEPA vacuum; thoroughly wet friable material containing asbestos to be removed or disturbed before and during Work unless wetting creates hazard or causes damage.

.4 Use garden reservoir type low - velocity sprayer or airless spray equipment capable of producing mist or fine spray.

.5 Perform Work in a manner to reduce dust creation to lowest levels practicable.

.5 Work is subject to visual inspection and air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas at no additional costs to the Departmental Representative.

.6 Clean-up:

.1 Frequently during Work and immediately after completion of work, clean up dust and asbestos-containing waste using HEPA vacuum or by damp mopping.

.2 Place dust and asbestos-containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.

.3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.

.4 Seal and remove double-bagged waste from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.

.5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.3 AIR MONITORING

.1 From beginning of Work until completion of cleaning operations, the Departmental Representative may collect air samples daily inside the Asbestos Work Area enclosures to ensure worker respiratory protection factors are not exceeded, in accordance with Provincial/Federal requirements.

.2 From beginning of Work until completion of cleaning operations, the Departmental Representative will collect air samples on a daily basis in the clean room and outside the enclosures.

.3 If air monitoring shows that areas outside work area enclosures or clean room are contaminated with asbestos fibers exceeding 0.05 fibers per cubic centimetre (f/cc), enclose, maintain, and clean these areas in same manner as that applicable to Asbestos Work Areas:

.1 Stop work and clean areas outside of Asbestos Work Areas when Phased Contrast Microscopy measurements exceed 0.05 fibres per cubic centimetre (f/cc) and correct procedures.

.2 All required cleaning, re-cleaning, additional air testing and/or inspections will be performed at no extra charge to the Client.

.4 The Departmental Representative will collect aggressive clearance air samples inside the enclosure following a final visual inspection of the Asbestos Work Area by the Departmental Representative. Samples will be analyzed and compared to applicable regulations.

.1 Final air monitoring results must show fibre levels of less than 0.01 fibres per cubic centimetre (f/cc).

.2 If air monitoring shows that areas inside the Asbestos Work Area enclosures are contaminated; enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area at no additional cost to the client.

.3 Repeat as necessary until fibre levels are less than 0.01 f/cc

.4 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Comply with requirements of this Section when performing the following work:

.1 The breaking, cutting, drilling, abrading, grinding, sanding, or vibrating of asbestos-containing materials if the work is done by means of a power tool that is not attached to a dust-collecting device equipped with HEPA filters.

.2 Refer to Section 01 14 25 – Designated Substances, for details on asbestos-containing materials.

1.2 RELATED SECTIONS

.1 Section 01 14 25 – Designated Substances

.2 Section 02 82 00.01 – Asbestos Abatement: Low Risk Precautions

.3 Section 02 82 00.02 – Asbestos Abatement: Moderate Risk Precautions

.4 Section 02 83 00 – Lead Precautionary Measures

.5 Section 02 89 00 – Silica Precautionary Measures

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.205-03, Sealer for Application to Asbestos-Fibre-Releasing Materials.

.2 Canadian Standards Association (CSA International).

.3 Department of Justice Canada.

.1 Canadian Environmental Protection Act (CEPA), 1999.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Safety Data Sheets (SDS).

.5 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.6 Underwriters' Laboratories of Canada (ULC).

.7 Canada Labour Code Part II, section 124 and 125.

.1 Canada Occupational Health and Safety Regulations

.8 DND Asbestos Management Directive

.9 *Ontario Dangerous Goods Transportation Act*

.10 Ontario Environmental Protection Act, R.R.O 1990,

.1 General – Waste Management, O. Reg 347/90, as amended.

.11 National Joint Council (NJC).

.1 Part XI – Hazardous Substances.

.12 Ontario Ministry of Labour, Immigration, Training and Skills Development (MLITSD).

.1 Occupational Health and Safety Act, R.S.O 1990, c. O1 (OSHA)

.1 O.Reg. 278/05 – Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations, as amended.

.2 O. Reg 490/09 – Designated Substances, as amended.

.3 O. Reg 213/91 - "Construction Projects", as amended.

1.4 DEFINITIONS

.1 Airlock: system for permitting ingress or egress without permitting air movement between contaminated area and uncontaminated area, typically consisting of two curtained doorways at least 2 m apart.

.2 Amended Water: water with a non-ionic surfactant wetting agent added to reduce surface tension of water to allow wetting of fibres.

.3 Asbestos-Containing Materials (ACMs): materials that contain 0.5 percent or more asbestos by dry weight, identified under Existing Conditions Article, including fallen materials, and settled dust.

.4 Asbestos Work Area: Area where actual removal and sealing and enclosure of spray or trowel-applied asbestos-containing materials takes place.

.5 Authorized Visitors: Departmental Representative, and representative(s) of regulatory agencies.

.6 Competent worker: in relation to specific work, means a worker who:

.1 Is qualified because of knowledge, training, and experience to perform the asbestos work.

.2 Is familiar with the provincial laws and with the provisions of the regulations that apply to the work.

.3 Has knowledge of all potential or actual danger to health or safety in the work.

.7 Curtained doorway: arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed as follows:

.1 Place two overlapping sheets of polyethylene over existing or temporarily framed doorway, secure each along top of doorway, secure vertical edge of one sheet along one vertical side of doorway, and secure vertical edge of other sheet along opposite vertical side of doorway.

.2 Reinforce free edges of polyethylene with duct tape and weight bottom edge to ensure proper closing.

.3 Overlap each polyethylene sheet at openings not less than 1.5 m on each side.

.8 DOP Test: testing method used to determine integrity of Negative Pressure unit using dioctyl phthalate (DOP) HEPA filter leak test. Negative air units and HEPA vacuums must be DOP tested on-site prior to start of work.

.9 Friable Material: material that when dry can be crumbled, pulverized, or powdered by hand pressure and includes such material that is crumbled, pulverized, or powdered.

.10 Hazardous Material Workplan: A brief report identifying the location and quantities of hazardous materials and the methods that will be used to remove, store, transport, and dispose of them.

.11 HEPA vacuum: DOP tested, 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.

.12 Negative pressure: system that extracts air directly from work area, filters such extracted air through High Efficiency Particulate Air filtering system, and discharges this air directly outside work area to exterior of building. Negative pressure systems will require DOP testing on-site, regardless of whether exhausting to interior or outdoors prior to work operations. Include in contract sum costs due to this requirement.

.1 System to maintain minimum pressure differential of 0.02 inches of water relative to adjacent areas outside of work areas, be equipped with alarm to warn of system breakdown, and be equipped with instrument to continuously monitor and automatically record pressure differences.

.13 Non-Friable Materials: material that when dry cannot be crumbled, pulverized, or powdered by hand pressure.

.14 Occupied Area: any area of building or work site that is outside Asbestos Work Area.

.15 Polyethylene sheeting sealed with tape: Polyethylene sheeting of type and thickness specified sealed with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane to protect underlying surfaces from water damage or damage by sealants, and to prevent escape of asbestos fibres through sheeting into clean area.

.16 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must be appropriate capacity for scope of work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Before beginning work:

.1 Ensure that dump operator is fully aware of hazardous nature of material being dumped, and proper methods of disposal. Submit proof satisfactory to the Departmental Representative that suitable arrangements have been made to receive and properly dispose of asbestos waste.

.2 Submit proof satisfactory to the Departmental Representative that every worker involved in a high-risk operation has successfully completed the Asbestos Abatement Worker Training Program. Submit proof of attendance in form of certificate.

.3 Submit proof satisfactory to the Departmental Representative that every worker who will be entering a high-risk asbestos work area, who will be using a respirator, has successfully completed **quantitative respirator fit testing,** for the respirator type personally issued to worker.

.4 Ensure supervisory personnel have attended asbestos abatement course, of not less than two days' duration, approved by the Departmental Representative. Submit proof of attendance in form of certificate. Minimum of one Supervisor for every ten workers.

.5 Submit layout of proposed enclosures and decontamination facilities to the Departmental Representative for review prior to work.

.6 Submit documentation including test results for sealer proposed for use.

.7 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.

.8 Submit Worker's Compensation Board status and transcription of insurance.

.9 Submit documentation including test results, fire and flammability data, and Safety Data Sheets (SDS) for chemicals or materials including but not limited to following:

.1 amended water.

.2 slow-drying sealer.

.10 Asbestos abatement section within Hazardous Material Work Plan.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial, and local requirements pertaining to asbestos, provided that in case of conflict among those requirements or with these specifications more stringent requirement applies.

.2 Health and Safety:

.1 Safety Requirements: worker and visitor protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area includes:

.1 Appropriate respirator (minimum full face air purifying respirator) equipped with HEPA P-100 filter cartridges, personally issued to worker, and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial (Ontario) Authority having jurisdiction. This respiratory protection shall also be provided by the contractor for any visitor or Departmental Representative accessing the space. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected, and inspected after use on each shift, or more often, if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean, and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker is not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable-type protective clothing (high-density polyethylene protective clothing (as approved by Departmental Representative) that does not

readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing shall consist of a head covering and full body covering that fits snugly at the ankles, wrists, and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing to include suitable footwear, and to be repaired or replaced if torn.

.2 Requirements for each worker:

.1 Remove street clothes in clean change room and put on respirator with new filters or reusable filters that have been tested as satisfactory, clean coveralls and head covers before entering Equipment and Access Rooms or Asbestos Work Area. Store street clothes, uncontaminated footwear, towels, and similar uncontaminated articles in clean change room.

.2 Remove gross contamination from clothing before leaving work area then proceed to Equipment and Access Room and remove clothing except respirators. Place contaminated work suits in receptacles for disposal with other asbestos - contaminated materials. Leave reusable items except respirator in Equipment and Access Room. Still wearing the respirator proceed naked to showers. Using soap and water wash body and hair thoroughly. Clean outside of respirator with soap and water while showering; remove respirator; remove filters and wet them and dispose of filters in container provided for purpose; and wash and rinse inside of respirator. When not in use in work area, store work footwear in Equipment and Access Room. Upon completion of asbestos abatement, dispose of footwear as contaminated waste or clean thoroughly inside and out using soap and water before removing from work area or from Equipment and Access Room.

.3 After showering and drying off, proceed to clean change room and dress in street clothes at end of each day's work, or in clean coveralls before eating, smoking, or drinking. If re-entering work area, follow procedures outlined in paragraphs above.

.4 Enter unloading room from outside dressed in clean coveralls to remove waste containers and equipment from Holding Room of Container and Equipment Decontamination Enclosure system. Workers must not use this system as means to leave or enter work area.

.3 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.4 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual asbestos abatement.

.5 Provide and post in Clean Change Room and in Equipment and Access Room the procedures described in this Section, in both official languages.

.6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

.7 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.

.2 Instruct Authorized Visitors in the use of protective clothing, respirators, and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Separate for reuse, and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.6 Fold up metal banding, flatten and place in designated area for recycling.

.7 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial, and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 mil bags or leak proof drums. Label containers with appropriate warning labels.

.8 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.8 EXISTING CONDITIONS

.1 Refer to the Specification Section 01 14 25 – Designated Substances for details on asbestos-containing materials.

.2 Notify Departmental Representative of asbestos-containing 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.

1.9 SCHEDULING

.1 Not later than ten (10) working days before beginning Work on this Project notify following in writing:

.1 Regional Office of Labour Canada.

.2 Provincial/Territorial, Department of Labour.

.3 Disposal Authority.

.2 Submit to Departmental Representative copy of notifications prior to start of Work.

.3 Hours of Work: perform work involving asbestos abatement located at the Building during hours specified by the Departmental Representative. **The work schedule must be approved in writing by the Departmental Representative in advance of work.** Contractor shall be available to work continuously from beginning to end of project.

1.10 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, and in use, cleaning, and disposal of respirators and protective clothing.

.2 Instruction and training related to asbestos and respirators includes, at minimum:

.1 the employer's general obligations;
.2 the effects of asbestos on health;
.3 the standards applicable and the sampling to be carried out;
.4 the worker's rights and obligations;
.5 individual and common protective devices and equipment;
.6 the tasks to be carried out and the equipment and tools to be used;
.7 safe working methods and procedures;
.8 prevention and verification methods.

.3 Instruction and training must be provided by competent, qualified person.

Part 2 Products

2.1 MATERIALS

.1 Polyethylene: minimum 0.15 mm thick unless otherwise specified; in sheet size to minimize joints.

.2 FR polyethylene: minimum 0.15 mm thick, woven fibre reinforced fabric bonded both sides with polyethylene.

.3 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.

.4 Wetting agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether, or other material approved by Departmental Representative mixed with water in concentration to provide adequate penetration and wetting of asbestos-containing material.

.5 Asbestos waste containers: Metal or fibre - type acceptable to dump operator with tightly fitting covers and 0.15 mm minimum thickness sealable polyethylene liners.

.1 Inner container: 0.15 mm thick sealable polyethylene waste bag.
.2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise, outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
.3 Label containers in accordance with applicable Regulations. Label in both official languages.

.6 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 asbestos fibres.

.7 Encapsulant: penetrating type conforming to CAN/CGSB-1.205.

Part 3 Execution

3.1 PREPARATION

.1 Work Areas:

.1 Shut off and isolate air handling and ventilation systems to prevent fibre dispersal to other building areas during work phase. Conduct smoke tests to ensure that duct work is airtight. Seal and caulk joints and seams of active return air ducts within Asbestos Work Area.

.2 Pre-clean moveable furniture and carpeting within proposed work area using HEPA vacuum and remove from work area to an appropriate temporary location.

.3 Pre-clean fixed casework, plant, and equipment within proposed work area(s), using HEPA vacuum and cover with polyethylene sheeting sealed with tape.

.4 Clean proposed work area(s) using, where practicable, HEPA vacuum cleaning equipment. If not practicable, use wet cleaning method. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA vacuum equipment.

.5 The spread of dust from the work area to be prevented by:

.1 Using enclosures of polyethylene or other suitable material that is impervious to asbestos (including, if the enclosure material is opaque, one or more transparent window areas to allow observation of the entire work area from outside the enclosure), if the work area is not enclosed by walls.

.2 Using curtains of polyethylene sheeting or other suitable material that is impervious to asbestos, fitted on each side of each entrance or exit from the work area.

.6 DOP test negative pressure units on site prior to work operations. Provide documentation to Departmental Representative. Put negative pressure system in operation and operate continuously from time first polyethylene is installed to seal openings until final completion of work including final cleanup. Provide continuous monitoring of pressure difference using automatic recording instrument. The system to maintain a negative air pressure of 0.02 inches (5 Pa) of water, relative to the area outside the enclosed area. The system to be inspected and maintained by a competent person prior each use to ensure that there is no air leakage, and if the filter is found to be damaged or defective, it to be replaced before the ventilation system is used. Vent negative air units to the outdoors.

.7 Seal off openings such as corridors, doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting sealed with tape.

.8 Cover floor and wall surfaces with polyethylene sheeting sealed with tape. Use one layer of FR polyethylene on floors. Cover floors first so that

polyethylene extends at least 300 mm up walls then cover walls to overlap floor sheeting.

.9 Build airlocks at entrances to and exits from work area(s) so that work area(s) are always closed off by one curtained doorway when workers enter or exit.

.10 At each access to work areas install warning signs in both official languages in upper case "Helvetica Medium" letters reading as follows where number in parentheses indicates font size to be used: "ASBESTOS (50 mm) DANGER (40 mm) Do not breathe dust (15 mm) Protective equipment must be worn (15mm), No admittance (15 mm) Inhaling asbestos dust may be harmful to your health (10mm)".

.11 After work area isolation, remove heating, ventilating, and air conditioning filters, pack in sealed plastic bags 0.15 mm minimum thick and treat as contaminated asbestos waste. Remove ceiling - mounted objects such as lights, partitions, other fixtures not previously sealed off, and other objects that interfere with asbestos removal, as directed by Departmental Representative. Use localized water spraying during fixture removal to reduce fibre dispersal.

.12 Maintain emergency and fire exits from work area(s) or establish alternative exits satisfactory to Fire Commissioner of Canada.

.13 Where application of water is required for wetting asbestos-containing materials, shut off electrical power, 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 lines and equipment.

.2 Worker Decontamination Enclosure System:

.1 Worker Decontamination Enclosure System includes Equipment and Access Room, Shower Room, and Clean Room, as follows:

.1 Equipment and Access Room: build Equipment and Access Room between Shower Room and work area(s), with two curtained doorways, one to Shower Room and one to work area(s). Install portable toilet, waste receptor, and storage facilities for workers' shoes and protective clothing to be re-worn in work area(s). Build Equipment and Access Room large enough to accommodate specified facilities, other equipment needed, and at least one worker allowing him /her sufficient space to undress comfortably.

.2 Shower Room: build Shower Room between Clean Room and Equipment and Access Room, with two curtained doorways, one to Clean Room and one to Equipment and Access Room. Provide one shower for every five workers and separate showers for male and female workers. Provide hot and cold water or water of a constant temperature that is not less than 40°C or more than 50°C. Provide individual controls inside the room to regulate water flow, and individual controls inside room to regulate temperature. Provide piping and connect to water sources and drains. Pump wastewater through 5 micrometre filter system acceptable to Departmental Representative before directing into drains. Provide soap, clean towels, and appropriate containers for disposal of used respirator filters.

.3 Clean Room: build Clean Room between Shower Room and clean areas outside of enclosures, with two curtained doorways, one to outside of enclosures and one to Shower Room. Provide lockers or hangers and hooks 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.

.3 Container and Equipment Decontamination Enclosure System:

.1 Container and Equipment Decontamination Enclosure System consists of Staging Area within work area, Washroom, Holding Room, and Unloading Room. Purpose of system is to provide means to decontaminate waste containers, scaffolding, waste and material containers, vacuum and spray equipment, and other tools and equipment for which Worker Decontamination Enclosure System is not suitable.

.1 Staging Area: designate Staging Area in work area for gross removal of dust and debris from waste containers and equipment, labelling and sealing of waste containers, and temporary storage pending removal to Washroom. Equip Staging Area with curtained doorway to Washroom.

.2 Washroom: build Washroom between Staging Area and Holding Room with two curtained doorways, one to Staging Area and one to Holding Room. Provide high - pressure low - volume sprays for washing of waste containers and equipment. Pump wastewater through 5 micrometre filter system before directing into drains. Provide piping and connect to water sources and drains.

.3 Holding Room: build Holding Room between Washroom and Unloading Room, with two curtained doorways, one to Washroom and one to Unloading Room. Build Holding Room sized to accommodate at least two waste containers and largest item of equipment used.

.4 Unloading Room: build Unloading Room between Holding Room and outside, with two curtained doorways, one to Holding Room and one to outside.

.4 Construction of Decontamination Enclosures:

.1 Build suitable framing for enclosures or use existing rooms where convenient, and line with polyethylene sheeting sealed with tape. Use one layer of FR polyethylene on floors, as applicable.

.2 Build curtained doorways between enclosures so that when people move through or when waste containers and equipment are moved through doorway, one of two closures comprising doorway always remains closed.

.5 Separation of Work Areas from Occupied Areas:

.1 Separate parts of building required to remain in use from parts of building or exterior used for asbestos abatement by means of airtight barrier system constructed as follows:

.1 Build suitable floor to ceiling lumber or metal stud framing, cover with polyethylene sheeting sealed with tape, and apply 9 mm minimum thick plywood. Seal joints between plywood sheets and

between plywood and adjacent materials with surface film forming type sealer, to create airtight barrier.

.2 Cover plywood barrier with polyethylene sealed with tape, as specified for work areas.

.6 Maintenance of Enclosures:

.1 Maintain enclosures in tidy condition.

.2 Ensure that barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

.3 Visually inspect enclosures at beginning of each working period.

.4 Use smoke methods to test effectiveness of barriers when directed by Departmental Representative.

.7 Do not begin Asbestos Abatement work until:

.1 Arrangements have been made for disposal of waste.

.2 For wet stripping techniques, arrangements have been made for containing, filtering, and disposal of wastewater.

.3 Work area(s) and decontamination enclosures and parts of building required to remain in use are effectively segregated.

.4 Tools, equipment, and materials waste containers are on hand.

.5 Arrangements have been made for building security.

.6 Warning signs are displayed where access to contaminated areas is possible.

.7 Notifications have been completed and other preparatory steps have been taken.

.8 Work area enclosure has been inspected and approved by the Departmental Representative.

.9 Locations for waste bins as designated by the Departmental Representative have been established. Keep bins covered and enclosed while at the site. Bin loading area shall be kept clean at all times.

3.2 SUPERVISION

.1 Minimum of one Supervisor for every ten workers is required.

.2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos-containing materials.

3.3 ASBESTOS REMOVAL

.1 Before removing asbestos:

.1 Prepare site.

.2 Spray asbestos material with water containing specified wetting agent, using airless spray equipment capable of providing "mist" application to prevent release of fibres. Saturate asbestos material sufficiently to wet it to substrate without causing excess dripping. Spray asbestos material repeatedly during work process to maintain saturation and to minimize asbestos fibre dispersion.

.2 Remove saturated asbestos material in small sections. Do not allow saturated asbestos to dry out. As it is being removed pack material in sealable plastic bags 0.15 mm minimum thick and place in labelled containers for transport.

.3 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 before moving containers to decontamination Washroom. Wash containers thoroughly in decontamination Washroom, and store in Holding Room pending removal to Unloading Room and outside. Ensure that containers are removed from Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.

.4 After completion of stripping work, wire brushed and wet-sponged surfaces from which asbestos has been removed to remove visible material. During this work keep surfaces wet.

.5 After wire brushing and wet sponging to remove visible asbestos and after encapsulating asbestos containing material impossible to remove, wet clean entire work area including Equipment and Access Room, and equipment used in process. After 24-hour period to allow for dust settling, wet clean these areas and objects again. During this settling period no entry, activity, or ventilation will be permitted. After second 24-hour period under same conditions, clean these areas and objects again using HEPA vacuum followed by wet cleaning. After inspection by Departmental Representative or designate, apply continuous coat of slow drying sealer to surfaces of work area. Allow at least 16 hours with no entry, activity, ventilation, or disturbance other than operation of negative pressure units during this period.

.6 Work is subject to visual inspection and air monitoring by Departmental Representative. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.7 Cleanup:

.1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.

.2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.

.3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.

.4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.

.5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.4 INSPECTION

.1 Perform inspection of Asbestos Work Area to confirm compliance with specification and governing authority requirements. Deviation(s) from these requirements that

have not been approved in writing by the Departmental Representative may result in Work stoppage, at no cost to the Departmental Representative.

.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 When asbestos leakage from Asbestos Work Area has occurred or is likely to occur, Departmental Representative may order Work shutdown.

.4 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.5 AIR MONITORING

.1 From beginning of Work until completion of cleaning operations, the Departmental Representative may collect air samples daily inside the Asbestos Work Area enclosures to ensure worker respiratory protection factors are not exceeded, in accordance with Provincial/Federal requirements.

.2 From beginning of Work until completion of cleaning operations, Departmental Representative will collect air samples on daily basis in the clean room and outside of work area enclosure(s) in accordance with Canada Labour Code.

.3 If air monitoring shows that areas outside work area are contaminated with asbestos fibers exceeding 0.05 fibers per cubic centimetre (f/cc), enclose, maintain, and clean these areas in same manner as that applicable to Asbestos Work Areas.

.1 Stop work and clean areas outside of Asbestos Work Areas when Phase Contrast Microscopy measurements exceed 0.05 fibres per cubic centimetre (f/cc) and correct procedures.

.2 All required cleaning, re-cleaning, additional air testing and/or inspections will be at no extra charge to Departmental Representative.

.4 Final air monitoring to be conducted as follows: After Asbestos Work Area has passed visual inspection by Departmental Representative, and acceptable coat of lock-down agent has been applied to surfaces within enclosure, and appropriate setting period has passed, Departmental Representative will perform aggressive air monitoring within Asbestos Work Area.

.1 Final air monitoring results must show fibre levels of less than 0.01 f/cc.

.2 If air monitoring results show fibre levels in excess of 0.01 f/cc, re-clean work area and apply another acceptable coat of lock-down agent to surfaces.

.3 Repeat as necessary until fibre levels are less than 0.01 f/cc.

.4 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.6 FINAL CLEANUP

.1 Following cleaning and air sampling by Departmental Representative shows that asbestos levels inside work area enclosure(s) do not exceed 0.01 fibres/cc, proceed with final cleanup.

.2 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible asbestos-containing particles observed during cleanup, immediately, using HEPA vacuum equipment.

.3 Place polyethylene seals, tape, cleaning material, clothing, and other contaminated waste in plastic bags and sealed labelled waste containers for transport.

.4 Include in clean-up Work areas, Equipment and Access Room, Washroom, Shower Room, and other contaminated enclosures.

.5 Include in clean-up sealed waste containers and equipment used in Work and remove from work areas, via Container and Equipment Decontamination Enclosure System, at appropriate time in cleaning sequence.

.6 Conduct final check to ensure that no dust or debris remains on surfaces as result of dismantling operations.

.7 As work progresses, and to prevent exceeding available storage capacity on site, remove sealed and labelled containers containing asbestos waste and dispose of at authorized disposal area in accordance with requirements of disposal authority. Ensure that each shipment of containers transported to dump is accompanied by Contractor's representative to ensure that dumping is done in accordance with governing regulations.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Lead abatement procedures for the removal/disturbance/repair of lead-containing surface coating materials on various building components, or materials suspected of containing lead, if required to accommodate the project scope of work.

.2 In the absence of other more stringent requirements, lead precautionary measures for paints/surface coatings shall be followed for the disturbance of mercury and chromium containing surface coatings. All work shall be subject to visual evaluation, surface wipe sampling, and air monitoring, at the discretion of the designated client representative.

.3 Refer to the Specification Section 01 14 25 – Designated Substances for details on lead-containing materials.

1.2 RELATED SECTIONS

.1 Section 01 14 25 – Designated Substances

.2 Section 02 82 00.01 – Asbestos Low-Risk Precautions

.3 Section 02 82 00.02 – Asbestos Moderate-Risk Precautions

.4 Section 02 82 00.03 – Asbestos High-Risk Precautions

.5 Section 02 89 00 – Silica Precautions

1.3 REFERENCES

.1 Department of Justice Canada.

.1 Canadian Environmental Protection Act (CEPA), 1999.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Safety Data Sheets (SDS).

.3 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.4 Ontario Ministry of Environment, Conservation and Parks (MECP).

.1 R.R.O. 1990, Reg. 347, General – Waste Management, as amended.

.5 Ontario Ministry of Labour, Immigration, Training and Skills Development (MLITSD).

.1 Occupational Health and Safety Act, R.S.O. 1990, c. O.1 (OHSA).

.1 O.Reg. 213/91, Construction Projects, as amended.

.2 R.R.O. 1990, Regulation 490/09, “Designated Substances”, as amended.

.2 Guideline: Lead on Construction Projects, September 2004, as revised.

.6 Canada Consumer Product Safety Act Surface Coating Materials Regulations SOR/2016-193, as amended.

1.4 DEFINITIONS

.1 Airlock: system for permitting ingress or egress without permitting air movement between contaminated area and uncontaminated area, typically consisting of two curtained doorways at least 2 m apart unless Site Conditions dictate otherwise.

.2 Authorized Visitors: Departmental Representatives or designated representatives, and representatives of regulatory agencies.

.3 Curtained doorway: arrangement of closures 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 polyethylene over existing or temporarily framed doorway, secure each along top of doorway, secure vertical edge of one sheet along one vertical side of doorway, and secure 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 proper closing. Overlap each polyethylene sheet at openings not less than 1.5 m on each side unless Site Conditions dictate otherwise.

.4 Hazardous Material Workplan: A brief report identifying the location and quantities of hazardous materials and the methods that will be used to remove, store, transport and dispose of them.

.5 Lead-Containing Paint: Paint that contains lead in concentrations greater than 90 parts per million, that may result in elevated airborne lead exposure during operations that disturb the paint.

.6 Lead-containing materials: Materials that are assumed to contain varying levels of lead from their historic composition.

.7 Lead-containing equipment: Equipment suspected of containing lead through historic application or identified as lead containing through labels/tags.

.8 Occupied Area: any area of building or work site that is outside the Lead Work Area.

1.5 ACTION AND INFORMATION SUBMITTALS

.1 One (1) week prior to the start of abatement work, submit proposed methodology for abatement procedures for review by Departmental Representative. The proposed methodology shall include:

.1 Products to be used complete with SDS information.

.2 List of protective equipment to be used by workers.

.3 Plan identifying area(s) of work for abatement procedures.

.4 Requirements for engineering controls, ventilation, etc.

.5 Requirements for access to and egress from the Lead Work Area.

.2 A written Health and Safety Plan specific to work of this Section. As a minimum this document must include:

.1 Classification of all lead abatement work in accordance with the criteria used in the document Guideline: Lead on Construction Projects issued by the Ontario Ministry of Labour.

.2 The identity of the “competent person” who will, on behalf of the Contractor, perform regular inspections of the lead abatement activities to prevent

dangerous, unhealthy or unsafe conditions. The “competent person” must be on site at all times while lead abatement activities are in progress.

.3 A description of the equipment and materials, controls, crew size, job responsibilities, and operations and maintenance procedures for each activity involved in the work of this Section.

.4 A description of the specific control methods to be used in the lead-containing paint and surface coatings abatement processes.

.5 A strategy to ensure that personnel are not exposed to airborne lead or other contaminants in concentrations that exceed the current Time Weighted Average Exposure Value (TWAEV).

.6 A description of the medical surveillance program in place for lead abatement workers.

.7 Names of products to be used in lead abatement work.

.3 Before beginning work:

.1 Obtain from appropriate agency and submit to Departmental Representative all necessary permits for transportation and disposal of lead-containing waste. Ensure that dump operator is fully aware of hazardous nature of material being dumped, and proper methods of disposal.

.2 Submit proof satisfactory to Departmental Representative that employees have had instruction on hazards of lead exposure, respirator use, dress, use of showers, entry and exit from work areas, and aspects of work procedures and protective measures.

.3 Submit proof in the form of a certificate that supervisory personnel have attended a lead-containing paint abatement course, of not less than 1-day duration.

.4 For each load of waste that leaves the site, submit landfill weigh scale receipts, shipping documents, and lead-containing waste manifests, as applicable based upon waste characterization.

.5 Lead abatement section within Hazardous Material Work Plan.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to lead, 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 Safety Requirements: worker and visitor protection.

.1 Eating, drinking, chewing, and smoking are not permitted in the Lead Work Area.

.2 Washing facilities consisting of a wash basin, water, soap and towels shall be provided by the Contractor. All workers shall use these washing facilities before eating, drinking, smoking or leaving the work site. Washing facility areas are to be designated by Departmental Representative

.3 Protective equipment and clothing to be worn by workers while in the Lead Work Area includes:

.1 Disposable-type protective clothing that does not readily retain or permit penetration of lead dust, consisting of full-body covering including head covering with snug-fitting cuffs at wrists, ankles, and neck.

.2 Respirator, personally issued to worker and marked as to efficiency and purpose, and acceptable to Authority having jurisdiction as suitable for level of lead exposure in the Lead Work Area. If disposable type filters are used, provide sufficient filters so that workers can install new filters following disposal of used filters and before re-entering contaminated areas.

.3 Ensure that no person required to enter the Lead Work Area has facial hair that affects seal between respirator and face.

.4 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.

.2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from the Lead Work Area.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Where leachate sampling has assumed materials are leachate hazardous for disposal, representative sampling of lead-containing materials that is representative of the applicable waste stream (i.e. sampling to include substrate material as applicable) can be performed by a competent person retained by the Contractor prior to disposal of lead-containing materials. Lead-containing waste streams are to be classified for disposal purposes using the Toxicity Characteristic Leachate Procedure at a certified analytical laboratory. All sampling procedures and submissions shall be approved of by the Departmental Representative. No additional costs shall be provided for undertaking additional TCLP sampling by the contractor.

.2 Place materials characterized as hazardous or toxic based upon leachate analysis in designated containers.

.3 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.4 Disposal of lead waste, including wash and rinse water, generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Label containers with appropriate warning labels.

.5 Provide manifests describing and listing waste created. Transport containers by approved means to licensed facility for disposal.

.6 Contractor is responsible to obtain all necessary permits, licenses and approvals to conduct the abatement.

1.8 EXISTING CONDITIONS

.1 Refer to the Section 01 14 25 – Designated Substances for details on lead-containing materials.

Part 2 Products

2.1 MATERIALS

.1 All materials brought to project site must be in good condition and free of lead dust. Disposable items must be of new materials only.

.2 Lead Waste Container: An impermeable container acceptable to disposal site and Ministry of Environment. Labelled as required. Comprised of one of the following:

.1 A 0.15 mm sealed polyethylene bag, inside a second 0.15 mm sealed polyethylene bag.

.2 A barrel suitable for lead wash water and/or sludge. Container must be acceptable to the waste hauler.

.3 Lead Cleaning Agent: A cleaning agent suitable for lead dust. Acceptable products:

.1 Detergents with a high phosphate content (containing at least 5% trisodium phosphate).

.2 Phosphate-free lead dissolving agent.

.4 FR polyethylene: minimum 0.15 mm thick, woven fibre reinforced fabric bonded both sides with polyethylene.

.5 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions.

2.2 EQUIPMENT

.1 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.

.2 Sprayer: Garden reservoir type, low velocity, capable of producing a mist or fine spray.

Part 3 Execution

3.1 PREPARATION

.1 Scaffolding

.1 Scaffolding in accordance with CAN/CSA-S269.2.

3.2 ABATEMENT WORK AREA PREPERATION

.1 Implement lead precautionary measures appropriate to the work completed in accordance with the MLITSD Guideline: Lead on Construction Projects, as amended.

.2 Type 1 Work Areas:

.1 Install polyethylene drop sheets below lead operations which produce or may produce dust, chips, or debris containing lead.

.3 Type 2 Work Areas:

.1 Install polyethylene drop sheets below lead operations which produce or may produce dust, chips, or debris containing lead.

.2 Post signs in sufficient numbers to warn of the lead hazard. There shall be a sign, at least, at each entrance to the Lead Work Area. The signs shall display the following information in large, clearly visible letters using both official languages:

.1 Lead dust, fume or mist hazard.

.2 Access to the work area is restricted to authorized persons.

.3 Respirators must be worn in the work area.

.4 Type 3 Work Areas:

.1 Post signs in sufficient numbers to warn of the lead hazard. There shall be a sign, at least, at each entrance to the Lead Work Area. The signs shall display the following information in large, clearly visible letters using both official languages:

.1 Lead dust, fume or mist hazard.

.2 Access to the work area is restricted to authorized persons.

.3 Respirators must be worn in the work area.

.2 Barriers, Partial Enclosures and Full Enclosures: Barriers, partial enclosures, and full enclosures shall be constructed to separate the Lead Work Area from the rest of the project. Barriers shall only be used where full and partial enclosures are not practical, including during exterior masonry work.

.1 Barriers:

.1 Ropes or barriers do not prevent the release of contaminated dust or other contaminants into the environment. However, they can be used to restrict access of workers who are not adequately protected with proper PPE, and also prevent the entry of workers not directly involved in the operation. Ropes or barriers shall be placed at a distance far enough from the operation that allows the lead-containing dust to settle. If this is not achievable, warning signs should be posted at the distance where the lead-containing dust settles to warn that access is restricted to persons wearing PPE.

.2 Barriers for lead-containing work areas are to prevent staff who are not equipped with PPE from working within 6 metres of lead-abatement work areas.

.2 Partial Enclosures:

.1 Partial enclosures allow some emissions to the atmosphere outside of the enclosure. Partial enclosures may consist of vertical tarps and floor tarps so long as the tarps are overlapped and securely fixed together at the seams. A

partial enclosure is not a suitable containment system if significant dust is being generated.

.3 Full Enclosures:

.1 Full enclosures are tight enclosures (with tarps that are generally impermeable and fully sealed joints and entryways). Full enclosures allow minimal or no fugitive emissions to reach the environment outside of the Lead Work Area. For full enclosures, the following requirements shall be met:

.1 The enclosure shall be constructed of windproof materials that are impermeable to dust.

.2 The enclosure shall be supported by a secure structure.

.3 All joints in the enclosure shall be fully sealed.

.4 Entrances to the enclosure shall be equipped with air locks.

.5 The escape of abrasive and debris from the enclosure shall be controlled, at air supply points, by the use of baffles, louvers, flap seals and filters.

.3 Worker Decontamination Enclosure System: Worker Decontamination Enclosure System includes Equipment and Access Room, Shower Room, and Clean Room, as follows:

.1 Construct Worker Decontamination Enclosure System as close to the work area as possible in area specified by Departmental Representative. Submit layout of proposed enclosures and decontamination facilities including location to Departmental Representative for review.

.2 Equipment and Access Room: build an Equipment and Access Room between Shower Room and Lead Work Area, with two curtained doorways, one to Shower Room and one to Lead Work Area. Install a waste receptor and storage facilities for workers' shoes and protective clothing to be reworn in Lead Work Area. Build Equipment and Access Room large enough to accommodate specified facilities, other equipment needed, and at least one worker allowing him /her sufficient space to undress comfortably.

.3 Shower Room: build a Shower Room between Clean Room and Equipment and Access Room, with two curtained doorways, one to Clean Room and one to Equipment and Access Room. Provide one shower for every five or fewer workers. Provide constant supply of hot and cold, or warm (between 40°C and 50°C) potable water. Provide piping and connect to water sources and drains. Provide soap, clean towels, and appropriate containers for disposal of used respirator filters.

.4 Clean Room: build a Clean Room between Shower Room and clean areas outside of enclosures, with two curtained doorways, one to outside of enclosures and one to Shower Room. Provide lockers or hangers and hooks for workers' street clothes and personal belongings. Provide storage for clean protective clothing

and respiratory equipment. Install a mirror to permit workers to fit respiratory equipment properly.

.4 Maintenance of Enclosures:

.1 Maintain enclosures in tidy condition.

.2 Ensure that barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

.3 Visually inspect enclosures at beginning of each working period.

.5 Do not begin lead abatement work until:

.1 Arrangements have been made for disposal of lead-containing waste.

.2 Arrangements have been made for containing, filtering, testing and disposal of waste water.

.3 Work areas, decontamination enclosures and parts of project site required to remain in use are effectively segregated.

.4 Tools, equipment, and materials waste containers are on hand.

.5 Arrangements have been made for building security.

.6 Warning signs are displayed where access to contaminated areas is possible.

.7 Notifications have been completed and other preparatory steps have been taken.

.8 Departmental Representative has reviewed preparatory work and provided written approval for lead abatement work to proceed.

3.3 SUPERVISION

.1 Minimum of one Supervisor for every ten or fewer workers is required.

.2 Approved Supervisor must remain within Lead Work Area during disturbance, removal, or other handling of lead-containing paint and other lead contaminated materials.

3.4 LEAD REMOVAL

.1 The removal or disturbance of asbestos-containing materials coated with lead-containing coatings must also be performed using appropriate asbestos and/or silica precautions as outlined in the specifications.

.2 Before removing lead-containing paint or disturbing other lead containing or contaminated materials:

.1 Prepare site.

.2 Spray surfaces to be disturbed, that are finished with lead-containing paint, with water using airless spray equipment capable of providing a “mist” application to prevent the release of dust.

.3 Lead-containing paint, and surface coating removal:

.1 Methods of lead-containing paint and surface coating removal/disturbance must be approved in writing by the approval from the Departmental Representative.

.4 At completion of lead-containing paint and surface coatings removals, perform the following clean-up:

.1 Wait at least 1-hour after active lead abatement work has ceased to allow airborne lead particles to settle.

.2 HEPA vacuum all surfaces within the Lead Work Area. Start vacuuming at the highest levels furthest from the Decontamination Facilities and work progressively downwards towards the Decontamination Facilities.

.3 Wash all surfaces with Lead Cleaning Agent and rinse with clean water. Start washing and rinsing at the highest levels furthest from the Decontamination Facilities and work progressively downwards towards the Decontamination Facilities.

.4 Repeat HEPA vacuuming, washing and rinsing as required to achieve clearance criteria.

3.5 INSPECTION

.1 Perform inspections of Lead Work Area to confirm compliance with specification and requirements of authorities having jurisdiction. Deviation from these requirements that have not been approved in writing by the Departmental Representative may result in Work stoppage, at no cost.

.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 When a leakage of liquid, dust or fume from the Lead Work Area has occurred or is likely to occur the Departmental Representative Construction Manager may order Work shutdown.

.1 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.6 AIR MONITORING AND SURFACE WIPE SAMPLING

.1 From beginning of Work until completion of cleaning operations, the Departmental Representative may be on site to collect air samples either inside or outside of the Lead Work Area in accordance with standard methods for workplace air sampling and analysis.

.1 This air monitoring does not relieve the Contractor of any responsibility for air monitoring inside the Lead Work Area to verify that the respiratory protection in use provides a suitable protection factor.

.2 Use results of air monitoring inside the Lead Work Area to establish type of respirators to be used. Workers may be required to wear sample pumps for up two full-shift periods.

.1 If airborne lead concentrations are above the protection factor of respirators in use, the Contractor shall:

.1 Stop abatement.

.2 Introduce more stringent engineering controls.

.3 Use a higher protection factor in respiratory protection for persons inside the Lead Work Area.

.2 If air monitoring shows that airborne lead concentrations outside the Lead Work Area exceed 0.025 mg/m³, the Contractor shall maintain and clean these areas, in same manner as applicable to the Lead Work Area, at no additional cost.

.3 Final clearance air monitoring will be performed at the sole discretion of the Departmental Representative.

.1 Final air monitoring results must show airborne lead levels less than 0.005 mg/m³.

.2 If air monitoring results show airborne lead levels in excess of 0.005 mg/m³, the Contractor shall re-clean the Lead Work Area at no additional cost.

.3 Repeat as necessary until airborne lead levels are less than 0.005 mg/m³.

.4 The following criteria shall be used to define an acceptable level of cleanliness after lead abatement activities:

.1 Where removal of paints and other surface coatings has been performed to accommodate the project scope of work:

.1 Visibly free of paint(s), primer(s), and surface coating(s), and/or associated dust.

.2 Residual lead dust concentration less than:

.1 2,150 micrograms/square metre for interior floor surfaces

.2 2,691 micrograms/square metre for interior windowsills

.3 8,611 micrograms/square metre for exterior surfaces

.4 Repeat cleaning as necessary until lead concentrations are below specified levels, at no additional cost.

3.7 FINAL CLEANUP

.1 Remove polyethylene sheet by rolling it towards the centre of the Lead Work Area. Immediately vacuum any visible paint chips, particles, dust and debris observed during cleanup using HEPA vacuum equipment.

.2 Place polyethylene seals, tape, cleaning material, clothing, and other contaminated waste in sealed labelled waste containers for transport.

.3 Include in clean-up Work areas, Equipment and Access Room, Shower Room, and other contaminated enclosures.

.4 Include in clean-up sealed waste containers and equipment used in Work and remove from work areas, at appropriate time in cleaning sequence.

.5 A final check may be carried out to ensure that no lead dust or debris remains on surfaces as a result of dismantling operations.

.6 As work progresses, and to prevent exceeding available storage capacity on site, remove sealed and labelled waste containers.

.1 Dispose of lead-containing waste in accordance with R.R.O. 1990, Regulation 347, as amended. Ensure that waste hauler and receiver are fully aware of hazardous nature of material to be disposed of and that guidelines and regulations for lead-containing waste disposal are followed.

.2 Ensure that materials removed during the Work of this Section are treated, packaged, transported and disposed of as lead-containing waste.

.3 Clean up waste routes and loading area after each load. Use lead abatement procedures if appropriate or requested by Departmental Representative.

.4 Drop garbage bins at designated locations. Keep bins covered and enclosed while at the site. Bin loading area shall be kept clean at all times.

.5 Transport all waste to a landfill licensed by the Authority having jurisdiction.

.6 Provide Departmental Representative with copies of shipping documents and lead-containing waste manifests for each load of waste. The Contractor is responsible to ensure that written documentation is submitted for each load of waste leaving the site.

.7 Cooperate with provincial inspectors and immediately carry out instructions for remedial work at landfill to maintain environment, at no additional cost.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This section specifies requirements and procedures for silica precautionary measures. This section conforms to the requirements of the Ontario Occupational Health and Safety Act, R.S.O. 1990, Regulation 490/09 “Designated Substances”, as amended.

.2 Comply with the requirements of this Section when performing the following work:

.1 Work at site which may involve contact with silica dust generated through such processes as sawing, cutting, grinding, blasting and/or breaking of the silica containing material.

.3 Refer to the following documents for details on silica-containing materials:

.1 Refer to the Specification Section 01 14 25 – Designated Substances

1.2 RELATED SECTIONS

.1 Section 01 14 25 – Designated Substances

.2 Section 02 82 00.01 – Asbestos Low-Risk Precautions

.3 Section 02 82 00.02 – Asbestos Moderate-Risk Precautions

.4 Section 02 82 00.03 – Asbestos High-Risk Precautions

.5 Section 02 83 00 – Lead Precautionary Measures

1.3 REFERENCES

.1 Comply with current Federal, Provincial, and local requirements pertaining to silica, provided that in case of conflict among these requirements or with these specifications the more stringent requirement applies. Comply with regulations in effect at time work is performed.

.2 Federal Legislation

.1 Canada Labour Code and associated regulations.

.3 Provincial legislation

.1 Ontario Occupational Health and Safety Act, R.S.O. 1990, Regulation 490/09 “Designated Substances”, as amended.

.2 Ontario Ministry of Labour, Immigration, Training and Skills Development – Silica on Construction Projects, as revised.

1.4 DEFINITIONS

.1 **Dangerous Goods:** product, substance, or organism that is specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.

.2 **Hazardous Material:** product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.

.3 **Hazardous Material Workplan**: A brief report identifying the location and quantities of hazardous materials and the methods that will be used to remove, store, transport and dispose of them.

.4 **Workplace Hazardous Materials Information System (WHMIS):** Canada-wide system designed to give employers and workers information about hazardous materials used in workplace. Under WHMIS, information on hazardous materials is provided on container labels, safety data sheets (SDS), and worker education programs. WHMIS is put into effect by combination of federal and provincial laws.

1.5 SUBMITTALS

.1 Silica abatement section within Hazardous Material Work Plan.

1.6 PRECAUTIONARY MEASURES AND PROCEDURES

.1 Execute work by methods to minimize raising silica dust from demolition operations. Where practical, wet methods or a dust collection system should be used to reduce dust.

.2 Adequate ventilation, including local exhaust ventilation, should be maintained to prevent the accumulation and recirculation of harmful concentrations of free crystalline silica in the work area.

.3 As practical, processes that generate silica dust should be completed in enclosed areas wherever possible to prevent the spread of silica dust outside of the work area.

.4 Implement and maintain silica dust control measures during work to ensure that silica levels do not exceed allowable limits.

.5 Departmental Representative may stop work at any time when release of silica dust to adjacent area is suspected. Contractor must discuss procedures that Contractor proposes to resolve problem. Make all necessary changes to operations prior to resuming any demolition activities that may cause release of silica dust at no extra cost to the Departmental Representative.

.6 Silica dust should be cleaned from machinery and work surfaces by wet sweeping, the use of sweeping compounds or vacuum cleaners fitted with a HEPA filter to prevent the recirculation of dusty air. Cleaning methods such as blowing with compressed air or dry sweeping should be avoided. Where exposure to free crystalline silica occurs, protective work clothing should be vacuumed before removal.

.7 Store material containing silica dust in closed containers or use other appropriate means to prevent dust from becoming airborne.

1.7 PERSONAL PROTECTIVE EQUIPMENT

.1 Anticipated minimum levels of personal protection based on work activity involving silica dust are listed below and are in addition to the personal protective equipment required for the completion of the demolition activities. Personal protection is dependent on the work practices and associated silica exposure risks.

- .1 Air purifying respirator equipped with HEPA filter cartridges or supplied-air type, personally issued to the worker and marked as to efficiency and purpose, and acceptable to the Provincial (Ontario) Authority having jurisdiction as suitable for silica and the level of silica exposure in the Work Area. If disposable type filters are used, provide sufficient filters so that workers can install new filters following disposal of used filters and before re-entering contaminated areas.
- .2 Eye Protection: Goggles, Safety glasses with side shields, or Face shield.
- .3 If requested by a worker,
  - .1 Hand Protection: Gloves
  - .2 Clothing: Full body protective clothing

1.8 AIR MONITORING

.1 If air monitoring shows that work areas contain crystalline silica above applicable regulated occupational exposure limits, these areas shall be cleaned by previously outlined methods at no additional cost to the Departmental Representative.

1.9 PERMITS

.1 Contractor is responsible to obtain all necessary permits, licenses and approvals to conduct the abatement.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

.4 Provide temporary dust screens, covers, railings, supports, and other protection in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

.5 Maintain access to egress, walkways, corridors, exits, and other adjacent occupied or partially-occupied facilities, unless approved, in writing, by the AHJ.

.1 Submit copy of written approval from the AHJ.

.6 (Reserved)

3.3 DEMOLITION AND REMOVAL REQUIREMENTS

.1 Demolish or remove select building items in accordance with CSA Z783.

3.4 DEMOLITION

.1 Demolish items as indicated on the Drawings and as required to facilitate new construction.

.1 Trim edges of partially demolished building materials to suit future use.

.2 Use methods to minimize dust, such as wetting dust-producing materials.

.3 Leave Work in safe and stable condition at end of each Working Day.

.4 Dispose of demolished items off site. Comply with hauling and disposal regulations of AHJ.

3.5 REMOVE AND REINSTALL

.1 Remove items indicated on the Drawings.

.2 Examine removed items. Confirm DCC Representative's acceptance for reinstallation if removed items appear in poor condition.

.3 Temporarily store, protect, and prepare removed items for re-use.

.4 Reinstall removed items as indicated on the Drawings.

3.6 REPAIRS AND RESTORATION

.1 Promptly repair damage to adjacent construction caused by work of this section. Patch existing surfaces to make suitable for new materials.

.2 Restore exposed finishes on patched surfaces. Extend restoration to adjoining construction to eliminate evidence of patching and refinishing.

.3 Below-Grade Areas: Rough grade below-grade areas. Make ready for subsequent excavation or new construction.

.4 Below-Grade Areas: Completely fill below-grade areas and voids caused by work of this section. Use satisfactory soil materials according to backfill requirements in section 31 23 33.01 Excavating, Trenching and Backfilling.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 This Section specifies fire stop and smoke seal systems and materials intended to fill gaps between fire separations, between fire separations and other construction assemblies, or used in or around items which fully or partially penetrate a fire separation, to restrict the spread of fire and smoke thus maintaining the integrity of a fire separation.

.2 This Section includes requirements for:

.1 Through-penetration fire stops:

.1 For openings created to allow a penetrating item such as piping, conduits, raceways, ducts, cable trays, cables, tubing or structural components to pass completely through a fire separation or fire-resistance rated assembly.

.2 Membrane penetration fire stops:

.1 For openings where penetrating items such as piping, conduits, raceways, ducts, cable trays, cables, tubing, recessed components (e.g., panels, electric boxes, devices) or structural components pass through only one membrane of a fire separation or fire-resistance rated assembly.

.3 Blank opening fire stops:

.1 For openings created in a fire separation where the penetrating item has not yet been installed or has been removed.

.4 Construction joint fire stops:

.1 For locations where adjacent fire separations or components of fire separations meet. Locations include: ceiling/wall and roof/wall joints, wall/wall joints at corners or in the same plane, wall/floor joints, floor/floor joints and ceiling/ceiling joints.

.2 Includes fire stops for seismic joints, vertical control joints, expansion joints, and joints which occur at the tops and bottoms of fire separation walls.

.3 Includes fire stops for head-of-wall to non-rated roof or floor assemblies.

.3 This Section includes fire stopping and smoke seal work for the entire Project including selection, installation and inspection of all required fire stops.

1.2 RELATED REQUIREMENTS

.1 Section 07 92 00 – Joint Sealants.

.2 Division 21 Fire suppression

.3 Division 26 Electrical

1.3 DEFINITIONS

.1 Fire Blocking: materials, components or system installed in a concealed space in the building to restrict the spread of fire and smoke in that concealed space or from that concealed space to an adjacent space.

.2 Fire Compartment: spaces within a building that are enclosed by exterior walls or separated from other parts of the building by enclosing Fire Separations having a Fire-Resistance Rating.

.3 Fire-Resistance Rating: time in minutes or hours that a material or assembly of materials will withstand the passage of flame and transmission of heat when exposed to fire, meeting the requirements of CAN/ULC-S101 or as determined by formal testing of material or assembly of materials, meeting requirements of CAN/ULC-S115, or an interpretation of information derived from formal testing in accordance with requirements of the Building Code and acceptable to the Authority Having Jurisdiction (AHJ).

.4 Fire Separation: assembly that acts as a barrier against the spread of fire, smoke and noxious gases resulting from combustion as defined by the Building Code and includes the following assemblies having a Fire-Resistance Rating requiring Fire Stopping as follows:

.1 Penetration-Type Fire Stop systems located within loadbearing walls and partitions.

.2 Penetration-Type Fire Stop systems located within non-loadbearing walls and partitions.

.3 Penetration-Type located within floor assemblies.

.4 Building Perimeter-Type located between floor assemblies and exterior wall and roof construction.

.5 Construction Joint-Type and other assemblies having a Fire-Resistance Rating indicated on Drawings or Schedules.

.5 Fire Stop: material, component or system, and its means of support, used to protect gaps between fire separations, between fire separations and other construction assemblies, or used in openings where penetrating items wholly or partially penetrate fire separations, to restrict the spread of fire and smoke thus maintaining the fire-resistance continuity of a fire separation.

.6 Fire Stop System: a specific site erected construction consisting of the assembly, fire stop materials, any penetrating items and their means of support which have met the requirements for an F, FT, FH, FTH and/or L rating when tested in a fire-resistance rated assembly in accordance with CAN/ULC-S115.

.1 F-Rating: the amount of time a fire stop system can remain in place without the passage of flame through the opening or the occurrence of flaming on the unexposed face of the fire stop.

.2 FT-Rating: a fire stop system with an F-Rating for the required time period which can also resists the transmission of heat through the fire stop during the same period and limit the rise in temperature on the unexposed face and/or penetrating item of the fire stop.

.3 FH-Rating: a fire stop system with an F-Rating for the required time period which can also resist the force of a hose stream without developing openings for a prescribed period.

.4 FTH-Rating: a fire stop system with an FT-Rating for the required time period which also passes the hose stream test for a prescribed period.

.5 L-Rating: largest test sample leakage rate, determined in accordance with the optional air leakage test in CAN/ULC-S115.

.7 Multi-penetration: two or more service penetrations through an opening in the fire separation.

.8 Non-rated Fire Separation: fire separation acting as a barrier to the spread of smoke until a response is initiated such as the activation of a fire suppression system.

.9 Single-penetration: single service penetration through an opening in the fire separation.

.10 System Design Listing: document providing proof of testing with technical details, specifications and requirements that leads to the application of a specific listed fire stop system.

1.4 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants

.2 ASTM E84-21, Standard Test Method for Surface Burning Characteristics of Building Materials

.3 ASTM E119-20, Standard Test Methods for Fire Tests of Building Construction and Materials

.4 ASTM E814-13a, Standard Test Method for Fire Tests of Penetration Firestop Systems

.5 ASTM E1966 15, Standard Test Method for Fire Resistive Joint Systems

.6 ASTM E2032-09, Standard Guide for Extension of Data From Fire Resistance Tests Conducted in Accordance with ASTM E 119.

.7 ASTM E2174-20A, Standard Practice for On-Site Inspection of Installed Firestops.

.8 ASTM E2393-20A, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

.2 Firestop Contractors International Association (FCIA):

.1 FCIA Firestop Manual of Practice, 6th Edition 2015

.3 Factory Mutual Approvals (FM):

.1 FM 4990-2009, Approval Standard for Fire stopping

.2 FM 4991-2013, Approval Standard for Firestop Contractors

.4 International Firestop Council (IFC)

.1 IFC Guidelines for Evaluating Engineering Judgments

.2 IFC Guidelines for Evaluating Engineering Judgments-Perimeter Fire Barrier Systems

.3 IFC Inspection Guidelines for Penetration Firestop Systems and Fire Resistive Joint Systems in Fire Resistance Rated Construction, 5th Edition

.5 National Fire Protection Agency (NFPA):

.1 NFPA 251-2006, Standard Methods of Tests of Fire Endurance of Building Construction and Materials

.6 National Research Council Canada (NRC):

.1 National Building Code of Canada (NBC) 2020

.2 Best Practice Guide on Fire Stops and Fire Blocks and Their Impact on Sound Transmission 2007

.7 ULC Standards (ULC):

.1 CAN/ULC-S101-14, Standard Method of Fire Endurance Tests of Building Construction and Materials

.2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

.3 CAN/ULC-S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials

.4 CAN/ULC-S115-11, Standard Method of Fire Tests of Firestop Systems

.8 Underwriters Laboratories Inc. (UL):

.1 UL 1479-2015, Fire Tests of Penetration Firestops

.2 UL Qualified Firestop Contractor Program

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings:

.1 Hold pre-installation meeting one week before beginning Work of this Section, with Contractor, Subcontractor and DCC Representative.

.1 Verify Project requirements.

.2 Review installation and substrate conditions.

.3 Discuss coordination with other Subcontractors.

.4 Review system design listings, manufacturer's installation instructions and warranty requirements.

.5 Review quantity and location of mock-ups.

.2 Hold pre-installation meetings with other trades to review:

.1 Installation procedures and precautions.

.2 Location, scheduling, phasing plan and sequencing of other work around fire stops that can affect the outcome of the installation.

.3 Requirements for annular opening sizes.

.4 Requirements and preparations for wall/floor single and multi-penetrations.

.5 Requirements for construction and perimeter joints.

.6 Mock-up requirements.

.3 Submit copies of applicable listed fire stop system details to each trade for opening preparation. Include installation details required for the listed system.

.4 Meeting minutes: DCC Representative to take minutes of pre-installation meetings and distribute to general contractor to distribute to affected trades/subtrades.

.2 Sequencing:

.1 Carry out work in accordance with the Phasing Plan outlined in Section 01 11 00 Summary of Work/ General Instructions.

.2 Proceed with installation only when submittals have been reviewed by DCC Representative.

.3 Install fire stops located in floor assemblies before interior partition erections.

.4 Pipe and duct insulation: Certified fire stop system component.

.1 Ensure pipe and duct insulation installation precedes fire stopping.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Qualification Statement:

.1 Submit contractor qualification statements and certificates demonstrating compliance with the qualification requirements of this Section, as described in PART 1-QUALITY ASSURANCE, within Ten working days after award of contract and before starting Work.

.3 Product Data:

.1 Submit manufacturer's product data for each type of fire stopping and smoke seal. Submit complete product data for each individual component and include:

.1 Product name and product number

.2 Product characteristics and performance criteria

.3 Physical size, finish and limitations

.4 Technical data on out-gassing, off-gassing and age testing

.5 Curing time

.6 Chemical compatibility to other construction materials

.7 Shelf life

.8 Life expectancy

.9 Temperature range for installation

.10 Humidity range for installation

.11 Sound attenuation STC-Rating

.2 Manufacture Product Certification:

.1 Submit manufacturer certification certifying products supplied comply with local regulations controlling use of Volatile Organic Compounds (VOC's) and are non-toxic to building occupants.

.3 Submit one copy of WHMIS Safety Data Sheets (SDS) for each individual component in accordance.

.4 Submit a comprehensive list of all products and components included in submittal.

.4 Shop Drawings:

.1 Submit shop drawings showing system design listings for Project including proposed materials, reinforcement, anchorage, fastenings and method of installation.

.2 Construction details to accurately reflect actual job conditions for each product and assembly.

.3 Submit details for materials and prefabricated devices.

.4 Submit electronic copy of shop drawings and include:

.1 Title page, labelled "Fire and Smoke Stop System Listings". Include project name, date and the names of the installation company and the manufacturer of proposed products.

.2 Table of Contents.

.3 List of each proposed listed fire stop system and corresponding service penetration type or joint type in a matrix spreadsheet schedule, indicating floor and wall system, including rating for each.

.4 Location of penetrations:

.1 Drawings showing the location of each penetration with a unique penetration identification number and associated listing number.

.2 Schedules listing each penetration with a unique identification number, their associated listing number, organized by floor, wall and ceiling area and indicating each room number.

.5 System Design Listings:

.1 Submit design listings for each listed fire stop system and each application identified in accordance with CAN/ULC-S115

.2 When more than one product is specified for the listed fire stop system or more than one packing/damming material is indicated, identify the item that will be used on this Project.

.6 Certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Manufacturer's Instructions: Submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

.6 Samples: Submit to DCC Representative a minimum one week before beginning site work:

.1 Submit two 300 x 300-mm samples of each system showing actual fire stop materials proposed for Project including anchors/fasteners and damming materials.

.2 Submit two samples of each type of label proposed for the identification of fire stops.

.7 Quality Assurance Submittals: Submit the following in accordance with Section 01 43 00 – Quality Assurance:

.1 Test reports in accordance with CAN/ULC-S101, CAN/ULC-S102, and CAN/ULC-S115.

.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.

.2 Document from Engineer of Record showing compliance of alternative fire stopping solution with CAN/ULC-S115 and the EJ guidelines provided by the National Research Council, Best Practice Guide on Fire Stops and Fire Blocks and Their Impact on Sound Transmission.

.3 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Manufacturer's Instructions: Submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.5 Manufacturer's Site Reports: Submit manufacturer's reports within three days of review, verifying compliance of Work, as described in SITE QUALITY CONTROL in Part 3 of this Section.

.8 Engineering Judgments(EJ):

.1 Where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stop configuration, review systems from other manufacturers to obtain a listed fire stop system.

.2 Submit an EJ from the system manufacturer if there are no listed systems available from other manufacturers.

.3 Prepare and submit an EJ in accordance with best practices established in the following documents:

.1 IFC Guidelines for Evaluating Engineering Judgments.

.2 IFC Guidelines for Evaluating Engineering Judgments-Perimeter Fire Barrier Systems.

.4 For each EJ submitted, include:

.1 Project name, number and location.

.2 A description of the proposed system with detailed drawing.

.3 Installation instructions.

.4 Complete descriptions of critical elements for the fire stop configuration.

.5 Copies of all referenced system design listings which EJ is based on.

.6 EJ issuer name and contact information.

.7 Date of issue of EJ with authorization signature of issuer.

.5 EJ shall only be issued by fire stop manufacturer's qualified technical personnel or in collaboration with the manufacturer by a knowledgeable registered Professional Engineer, a Fire Protection Engineer or an independent testing agency that provides testing and listing services for fire stop systems similar to the EJ being contemplated.

.6 EJ shall be based upon interpolations of previously tested fire stop systems that are either sufficiently similar in nature or clearly bracket the conditions upon which the EJ is to be given. Additional knowledge and technical interpretations based upon accepted engineering principles, fire science and fire testing guidelines (e.g., ASTM E2032) may also be used as further support data.

.7 EJ shall be based upon knowledge of the elements of the construction to be protected and understanding of the probable behaviour of that construction and the recommended fire stop system protecting it were they to be subjected to the adequate standard fire test method for the required fire rating duration.

.8 EJ shall be limited to the specific conditions and configurations for which it was created and should be based upon reasonable performance expectations for the recommended fire stop system under those conditions.

.9 EJ shall be accepted only for a single specific job and location and should not be transferred to any other job or location without thorough and appropriate review of all aspects of the next job or location's circumstances.

.1 Manufacturer letter stating their opinion, with supporting justification, that the EJ will perform as a fire stop system when subjected to the appropriate standard fire test method for the required fire rating duration.

.10 Once the EJ has been reviewed, submit to the AHJ for final approval.

.9 Closeout Submittals:

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.10 Operation and Maintenance Data: Submit maintenance data for incorporation into manual, including:

.1 WHMIS Safety Data Sheets (SDS),

.2 product data and manufacturer's installation and maintenance instructions for each product/system used on this project,

.3 approved system design listings and EJs, and

.4 matrix schedule listing all system design listings and EJs with a description of their penetration or joint type.

.5 Certifications:

.1 Provide proof of training for each worker that performed installation on the Project.

.2 Provide proof of company installing fire stopping and smoke seals is a Member in Good Standing with FCIA.

.3 Certification of company as a ULC Qualified or FM 4991 Approved Firestop Contractor, including the Designated Responsible Individual (DRI) certificate.

.4 Accreditation of third-party inspection firm.

.6 Manufacturer's field reports.

.7 Warranty information on fire stop installations.

.8 Life expectancy of each product installed as part of Project. For each system, list the installation date of products and the expected expiration date (month/year).

.11 Record Documentation:

.1 Maintain a daily log of all activities on site during the course of construction. Submit a copy of all daily logs after completion of fire stopping work.

.2 As-built Drawings:

.1 Submit a marked-up set of Drawings to provide referencing system identifying the location of each fire stop.

.2 Identify each penetration type fire stop with their penetration identification number.

.3 Provide detailed Drawings of system design listings for each type of fire stop (i.e., through-penetration, membrane penetration, blank opening, construction joint, building perimeter).

.4 Fire Stop Schedules:

.1 Submit complete fire stop schedules for floors, walls and ceilings.

.2 Indicate all penetration fire stops and joint fire stops through each reference wall, floor and ceiling in the schedules.

.3 Cross-reference firestop schedules with as-built drawings and indicate design listing numbers associated to each penetration fire stop and joint fire stop.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: Use materials and methods of determining required thickness of application that have the full acceptance of AHJ and that are tested in accordance with CAN/ULC-S115, and form a part of a ULC or cUL listed system, Engineered Judgement or Equivalent Fire Resistance Rated Assembly.

.2 Provide systems selection and analysis, installation and inspection of fire stop systems in accordance with the recommended practices detailed in the following guides:

.1 FCIA Firestop Manual of Practice (MOP).

.3 Qualifications:

.1 Contractor specializing in selection and installation of fire stops and approved by manufacturer.

.2 The installers are recognized as a Member in Good Standing with the Firestop Contractors International Association (FCIA). Submit proof of current membership.

.3 Training: Workers, including site supervisor, to complete:

.1 Manufacturer training on the products/systems installed as part of this Section.

.4 Certified Firestop Contractor: company certified with one of the following programs:

.1 ULC Qualified Firestop Contractor Program. Submit signed copy of certificate.

.2 FM 4991 Approved Firestop Contractor. Submit signed copy of FM Approval certificate.

.4 Mock-ups:

.1 Construct mock-up of fire stop systems in accordance with Section 01 43 00 – Quality Assurance.

.2 Before beginning construction, provide mock-up of each proposed listed fire stop system for review by DCC Representative. Mock-up shall include work by other trades to demonstrate the required finish work, such as steel stud/gypsum board trade framing out multi-penetration openings.

.3 Install proposed identification labels for each penetration.

.4 Locations for mock-ups as directed by the DCC Representative.

.5 After mock-up completion and adequate curing time for materials, provide a minimum of 48 hours notification to DCC Representative to conduct review.

.6 Manufacturer's representative shall be present during review of mock-ups.

.7 Correct mock-up deficiencies as directed by DCC Representative. Mock-up may remain as part of finished work.

.8 DCC Representative may perform destructive tests to each mock-up to ensure the system meets or exceeds the approved system design listing.

.5 Manufacturer Site Visits:

.1 Conducted after delivery and storage of products, and when preparatory Work is complete, but before installation begins.

.2 During progress of work at 25%, 50%, and 75% completion.

.3 Conducted again upon completion of Work and after final cleaning is complete.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements.

.2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings, manufacturing date, shelf-life expiry date.

.2 Storage and Protection:

.1 Store materials in a well-ventilated, dry indoor location and in accordance with manufacturer's instructions.

.2 Coordinate delivery of materials with scheduled installation dates to allow minimum storage time on site.

.3 Comply with recommended procedures, precautions and measures described in WHMIS Safety Data Sheets (SDS).

.3 Waste Management and Disposal:

.1 Perform in accordance with Section 01 74 00 – Cleaning & Waste Management.

1.9 AMBIENT CONDITIONS

.1 Ambient Conditions:

.1 Install fire stops and smoke seals when ambient and substrate temperatures are within the limits prescribed by the manufacturer and when the substrate is dry and without risk of condensation.

.2 Maintain manufacturer's recommended ambient and substrate temperatures for 48 hours before and 72 hours after installation.

.2 Ventilate fire stops and smoke seals in accordance with manufacturers' instructions by natural means or, where this is inadequate or not available, use forced air circulation.

1.10 WARRANTY

.1 Extend 12 month warranty period to 24 months for Work of this Section.

.2 Manufacturers shall warrant work of this Section against defects and deficiencies in the product material for a period of 24 months. Promptly correct any defects or deficiencies which become apparent within warranty period at no expense.

.3 Contractor warrants workmanship on materials and installation for a period of 24 months. Promptly correct any defects or deficiencies which become apparent within warranty period at no expense.

Part 2 PRODUCTS

2.1 MANUFACTURERS

.1 Provide products from a single manufacturer, to the greatest extent possible, to perform all fire stopping work. Materials of different manufacturers will not be permitted without authorization from DCC Representative.

.2 Provide a listed system from an alternative where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stopping application to avoid providing an Engineering Judgment.

2.2 PERFORMANCE/DESIGN CRITERIA

.1 Fire stop and smoke seal systems consisting of a material or combination of materials installed to maintain the integrity of the fire-resistance rating of a fire separation in accordance with the requirements of the NBC.

.2 Performance Requirements: Manufacturer shall design proprietary assemblies to withstand the listed ratings in accordance with the NBC, ULC Standards, and AHJ, and as follows:

.1 Non-rated fire separations: Provide L-Rated smoke protection fire stop system for application on both sides of separation.

.2 Provide through-penetration fire stop and joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of penetrated assembly, such as:

.1 Fire-resistance rated loadbearing walls, including partitions, with fire protection rated openings.

.2 Fire-resistance rated non-loadbearing walls, including partitions with fire protection rated openings.

.3 Fire-resistance rated floor assemblies.

.3 "F" Rated Systems: Provide through-penetration fire stop systems with F-ratings indicated, as determined by CAN/ULC-S115 or ASTM E814, and equal to or exceeding the fire-resistance rating of the penetrations created during construction.

.4 "T" Rated Systems: Where fire stop systems protect penetrating items from potential contact with adjacent materials, provide through-penetration fire stop systems with T-ratings and F-ratings indicated, as determined by CAN/ULC-S115 or ASTM E814, for the following conditions:

.1 Penetrations located outside wall cavities.

.2 Penetrations located outside fire resistive shaft enclosures.

.3 Penetrations located in a construction containing fire protection rated openings.

.4 Penetrating items larger than a 100-mm-diameter nominal pipe or 100 cm^2 in overall cross-sectional area.

.5 Fire stopping and Smoke Seal Systems Exposed to View: Provide products that after curing do not deteriorate when exposed to view, traffic, moisture, and physical damage both during and after construction, and as follows:

.1 Provide moisture resistant through-penetration fire stop systems for piping penetrations for plumbing and wet pipe sprinkler systems.

.2 Provide fire stopping and smoke seal systems capable of supporting anticipated floor loads either by installing floor plates or by other means for floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic.

.3 Provide fire stopping and smoke seal systems not requiring removal of insulation for penetrations involving insulated piping.

.4 Provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 50 for fire stopping, smoke seal, and joint systems exposed to view.

.5 Architectural considerations: When fire stop system is exposed to view, consider architectural finish, potential traffic, and exposure to moisture and heat.

.6 Fire Resistance of Joint Systems: Assembly ratings and movement capabilities shall be as indicated with assembly ratings equal to or exceeding the fire-resistance rating of constructions in which joints are located.

.3 Dynamic Joints: Where required, design fire stop and smoke seal systems to accommodate a defined amount of movement in structural elements, construction joints and mechanical piping caused by expansion or contraction. Systems should also accommodate movement and sound and vibration control in mechanical installations.

.4 Insulated Pipes and Ducts: Design and test listed fire stop system with the actual insulation materials penetrating the fire separation, as indicated on the system design listing.

.5 Use in Wet Areas: water-based products are unacceptable in wet areas or areas that may be subject to occasional water exposure or flooding during and after construction.

2.3 MATERIALS

.1 Compatibility: Under conditions of service and application, provide fire stopping and smoke seal systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating the systems, as demonstrated by fire stopping and smoke seal system manufacturer based on testing and site experience, and as follows:

.1 Asbestos-free materials and systems capable of maintaining an effective barrier against the passage of flame, smoke and water and the transmission of heat in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended, as indicated on System Design Listing.

.2 Fire Stop System Rating: To match fire-resistance rating of fire separation as indicated on Drawings.

.3 Service penetration assemblies and fire stop components: Certified by testing laboratory to CAN/ULC-S115.

.4 Provide elastomeric seal or non-shrink foam cement mortar for fire and smoke stop systems at openings intended for re-entry, such as cables. Do not use cementitious or rigid seal at such locations.

.5 Provide elastomeric protection for fire and smoke stop systems at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control. Do not use a cementitious or rigid seal at such locations. Exemption for fire dampers.

.6 Provide elastomeric seal for fire and smoke seals behind and around mechanical and electrical boxes within wall, floor, and ceiling assemblies.

2.4 FILL MATERIALS

.1 General:

.1 Provide fire stopping and smoke seal systems containing the types of fill materials indicated in SCHEDULE in Part 3 of this Section by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

.2 Fire stopping and smoke seal systems shall be tested in accordance with CAN/ULC-S115 and be comprised of asbestos free materials and systems capable of maintaining an effective barrier against flame, smoke and gases. Fire stopping and smoke seal systems not to exceed opening sizes for which they are intended for the ratings as indicated on Drawings.

.2 Latex Sealants: Single component latex formulations that after curing do not re-emulsify during exposure to moisture.

.3 Fire Stopping and Smoke Seal Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.

.4 Cable Penetration Devices:

.1 Pre-manufactured intumescent blocks

.2 Pre-manufactured sleeves, consisting of an adjustable core

.3 Pre-manufactured cable management system, consisting of a system of intumescent inserts and adjustable cores

.5 Intumescent Composite Sheets: Rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.

.6 Intumescent Putties: Non-hardening dielectric, water resistant putties containing no solvents, inorganic fibres, or silicone compounds.

.7 Intumescent Spray Foam: Expanding spray-in-place intumescent foam sealant.

.8 Intumescent Wrap Strips: Single component intumescent elastomeric sheets with aluminum foil on one side.

.9 Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.

.10 Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E136, with flame-spread and smoke-developed ratings of zero per ASTM E84.

.11 Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant of grade indicated below:

.1 Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces. Non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/gunnable sealant, unless indicated fire stop system limits use non-sag grade.

.12 Mortars: Pre-packaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

.13 Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass fibre cloth cases filled with a combination of mineral fibre, water insoluble expansion agents and fire-retardant additives.

.14 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in-place to produce a flexible, non-shrinking foam.

.15 Silicone Sealants: Moisture curing, single component, silicone based, neutral curing elastomeric sealants of grade indicated below:

.1 Grade for Horizontal Surfaces: Pourable (self-levelling) formulation for openings in floors and other horizontal surfaces.

.2 Grade for Vertical Surfaces: Non-sag formulation for openings in vertical and other surfaces.

.16 Ceramic-Fibre and Mastic Coating: Ceramic fibres in bulk form formulated for use with mastic coating, and ceramic fibre manufacturer's mastic coating.

.17 Ceramic-Fibre Sealant: Single-component formulation of ceramic fibres and inorganic binders.

2.5 MIXING

.1 For those products requiring mixing before application, comply with fire stopping and smoke seal system manufacturer's instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.6 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

.1 Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer that comply with ASTM C920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

.2 Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

.1 Additional Movement Capability: When tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, provide sealant with the capability to withstand the changes in joint width existing at the time of installation, and remain in compliance with other requirements of ASTM C920.

.3 Multicomponent, Non-sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

.1 Additional Movement Capability: When tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, provide sealant with the capability to withstand the change in joint width existing at the time of installation, and remain in compliance with other requirements of ASTM C920.

.4 Single-Component, Non-sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

2.7 FIRE STOP IDENTIFICATION

.1 Identification Labels and Markings: Permanent for the expected service life of the installation.

.2 Fire Stopped Penetrations:

.1 Provide identification labels at each penetration.

.2 Identification labels: tamper-evident frangible stickers with the following information:

.1 penetration number

.2 floor number

.3 room number

.4 product name and number

.5 system design number

.6 fire rating required in hours.

.7 fire stop contractor's name and phone number

.8 installer's name

.9 date of installation

.10 re-penetrated by: company, installer and date

.3 Indicate on label that fill material around the penetration is a fire stop system and shall not be disturbed except by authorized personnel.

.3 Fire Separation (Barrier) Markings:

.1 Provide identification for all vertical fire separations.

.2 Identification markings: tamper evident stickers with lettering at least 75 mm in height with a minimum 10-mm stroke in contrasting colour.

.3 Incorporate assembly's fire-resistance rating and the following suggested wording, "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS", or other accepted wording.

.4 Include horizontal red painted line, 75 mm in width, between identification markings.

.5 For occupied areas with exposed ceilings: Use 50-mm red dot adhesive stickers.

2.8 ACCESSORIES

.1 Provide components for each fire stopping and smoke seal system needed to install fill materials. Use only components specified by fire stopping and smoke seal system manufacturer and approved by the qualified testing and inspecting agency for fire stopping and smoke seal systems indicated on Drawings.

.2 Primers: To manufacturer's recommendation for specific material, substrate, and end use.

.3 Water (if applicable): Potable, clean and free from harmful amounts of deleterious substances.

.4 Metal Fire Stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m^2, minimum metal core thickness 0.912 mm.

.5 Fire Stop Insulation: Pre-formed, semi-rigid, non-combustible mineral wool, pre-cut in 1220-mm lengths to required depth and width.

.6 Junction Box/Outlet Sealing Putty: Intumescent putty, pre-formed in pads.

.7 Sealants: Good adhesion without use of primer, high visibility safety colours.

.1 Flame-spread rating: Maximum 25

.2 Smoke development classification: Maximum 50

.3 For vertical joints: Non-sagging

.4 For horizontal joints: Single component, self-levelling

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verify that conditions of substrates previously installed are acceptable for product installation in accordance with manufacturer's instructions and approved system design listings for each condition.

.2 Verify that all joints, service penetrating elements and supporting devices/hangers have been properly installed as indicated on approved system design listings. Remove all temporary lines and markings to meet the approved system design listings.

.3 Verify that proposed fire stop system consists of components that are compatible with each other, with substrates forming the openings, and with items, if any, penetrating the fire stop under conditions of application and service, as demonstrated by the fire stop manufacturer based on testing and site experience.

.4 Pipe and Duct Insulation: Confirm that proposed fire stop system has been tested with the actual insulation penetrating the fire separation on site, as indicated in the approved system design listing. Maintain insulation around pipes and ducts penetrating the fire separation.

.5 Ensure no additional items have been installed through opening that does not appear on the approved system design listing.

.6 Ensure fire stopped areas are accessible for proper application and that conditions are suitable for installation of the fire stop system. Areas to remain accessible for inspection.

.7 Report in writing to DCC Representative any defective surfaces or conditions affecting the fire stop system installation immediately and before commencing any installations.

.8 Proceed only once defected surfaces or conditions have been corrected.

.9 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.

.1 Ensure that substrates and surfaces are clean, dry and frost free.

.2 Ensure substrates and surfaces are free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

.2 Prepare surfaces in contact with fire stop and smoke stop materials to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

.5 Protect adjacent work areas and finish surfaces from damage during product installation.

.6 Prime surfaces as required.

.7 Ensure multi-penetration openings have been framed and boarded out around annular openings, as indicated in the system design listing before prepping the opening.

3.3 INSTALLATION

.1 Install fire stop and smoke seal materials and components in accordance with manufacturer's certified tested system listing.

.2 Coordinate with other sub-trades to ensure that all pipes, conduits, cables, and other items, which penetrate fire separations, have been permanently installed before installation of fire stop systems.

.3 Schedule work to ensure that fire separations and all other construction that conceals penetrations are not erected before installation of fire and smoke seal systems

.4 Seal holes or voids made by through-penetrations, poke-through termination devices, and un-penetrated openings or joints to ensure that both continuity and integrity of fire separation are maintained.

.5 Tool or trowel exposed surfaces to neat finish.

.6 Remove excess compound promptly as work progresses and upon completion.

.7 Protect gaps around recessed components (e.g., panels, electrical boxes, outlets) with sealing putty in accordance with manufacturer's instructions.

.8 Do not use damaged or expired material.

3.4 INSTALLATION-JOINT FIRE STOPS

.1 For sealant applications, install joint fillers to support fire stop materials during application. Position joint fillers to ensure fire stop material cross-sectional shape and thickness relative to the joint width allows for optimum sealant movement, while developing the required fire-resistance rating.

.2 Install fire stops using techniques recommended by the manufacturer:

.1 Fully wetting joint substrates to optimize adhesion.

.2 Completely filling recesses provided for each joint configuration.

.3 Tool non-sag fire stop materials immediately after their application and before the time skinning begins. Form smooth, uniform beads of configuration indicated or required to

.1 provide required fire-resistance rating,

.2 eliminate air pockets, and

.3 ensure contact and adhesion with sides of joint.

.4 Joint Systems and Perimeter Fire Containment Systems:

.1 For systems with dynamic joints, ensure movement capabilities of the installation meet or exceed the movement expectations of the system design listing and manufacturer's installation instructions.

3.5 INSTALLATION – THROUGH PENETRATION JOINT SEALANTS

.1 Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position required to achieve fire ratings of designated through-penetration fire stop systems.

.2 Install fill materials for through-penetration fire stop systems by techniques recommended by the manufacturer to produce the following results:

.1 Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

.2 Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

.3 For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

.3 Remove combustible forming materials and other accessories not indicated as permanent components of fire stop systems.

3.6 IDENTIFICATION

.1 General:

.1 Clean substrate before applying identification.

.2 Determine final location of identification on site.

.3 Identification is not required on both sides of the fire separation.

.4 Refer to Drawings for locations of fire separations and rating required.

.2 Fire Stopped Penetrations:

.1 Install identification label adjacent to each fire stopped wall/floor service penetration. Provide one identification label per single opening or per grouping cluster.

.2 Securely apply identification to substrate by providing adequate adhesive

.3 Secure tags with metal fasteners or hang with metal chain or wire.

.4 Identification shall be completely filled out and installed before requesting substantial performance.

.3 Fire Separations (Barriers):

.1 Position identification at least 4500 mm from end of each wall and at intervals not exceeding 9000] mm along wall/floor joint fire stops.

.2 Install markings within ceiling spaces, 600] mm below horizontal fire separation or roof structure unless otherwise indicated on Drawings.

.3 Review location of identification with DCC Representative for occupied areas with exposed ceilings before proceeding.

3.7 REPAIRS AND MODIFICATIONS

.1 Identify damaged or re-entered seals requiring repair or modification.

.2 Remove loose or damaged materials. If adding penetrating items, remove sufficient material to insert new elements and to avoid damaging the balance of the seal.

.3 Ensure sealed surfaces are clean and dry.

.4 Use only materials that are suitable for repair of original seal, as approved by manufacturer. Do not mix products from different manufacturers.

3.8 SITE QUALITY CONTROL

.1 Inspections: Notify DCC Representative when ready for inspection and before concealing or enclosing fire stop materials and service penetration assemblies.

.2 Manufacturer's Field Services:

.1 Mock-ups: Manufacturer to provide confirmation that the fire stop system installed meets or exceeds the system design listing requirements for each mock-up application.

.2 Obtain report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Site Reports as described in SUBMITTALS in Part 1 of this Section.

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

3.9 INSPECTIONS

.1 Upon completion of construction and before requesting substantial performance review, fire stop contractor and manufacturer's representative shall inspect all fire stopping work and prepare a deficiency list. Submit deficiency list to DCC Representative for review. Repair any deficiencies and re-inspect work to ensure that all deficiencies have been completed)

.2 Submit formal request for substantial performance review of work once all work is completed, quality control has been performed and all fire stop installations have been inspected and identified with the approved fire stop identification labels.

.3 DCC Representative will conduct the substantial performance review in the presence of the fire stop Contractor and the manufacturer's representative.

3.10 CLEANING

.1 Perform cleaning in accordance with Section 01 74 00 – Cleaning.

.2 Remove equipment, excess materials and debris and clean adjacent surfaces immediately after application. Use methods and cleaning materials approved by manufacturer.

.3 Protect fire stops during and after curing period from contact with contaminating substances

.4 Remove temporary dams after initial set of fire stop and smoke seal materials.

3.11 SCHEDULE

.1 Provide fire stop and L-Rated smoke-resistant fire stop systems at locations shown on Drawings and as indicated on details.

.2 Design and provide through-penetration fire stopping and smoke seals as follows:

.1 Systems with no penetrating items, select one or more of the following fill materials:

.1 latex sealant

.2 silicone sealant

.3 intumescent putty

.4 intumescent foam blocks or boards

.5 intumescent spray foam

.2 Systems for metallic pipes, conduit, or tubing, select one or more of the following fill materials:

.1 latex sealant

.2 silicone sealant

.3 intumescent putty

.4 intumescent foam blocks or boards

.5 intumescent spray foam

.3 Systems for non-metallic pipe, conduit, or tubing, select one or more of the following fill materials:

.1 latex sealant

.2 silicone sealant

.3 intumescent putty

.4 intumescent foam blocks or boards

.5 intumescent spray foam

.4 Re-enterable and cable managed systems for electrical, and data and communications cables:

.1 prefabricated fire stop sleeve

.2 preformed intumescent blocks

.3 preformed intumescent blocks

.4 prefabricated cable pathways

.5 Systems for electrical, and data and communications cables, select one or more of the following fill materials:

.1 latex sealant

.2 silicone sealant

.3 intumescent putty

.4 silicone foam

.5 prefabricated fire stop sleeve

.6 preformed intumescent blocks

.7 preformed intumescent blocks (roxtec)

.8 prefabricated cable pathways (ez-path)

.9 intumescent foam blocks or boards

.10 intumescent spray foam

.6 Systems for cable trays, select one or more of the following fill materials:

.1 latex sealant

.2 intumescent putty

.3 silicone foam

.4 pillows/bags

.5 intumescent foam blocks or boards

.7 Systems for insulated pipes, select one or more of the following fill materials:

.1 latex sealant

.2 intumescent putty

.3 silicone foam

.4 intumescent wrap strips

.5 intumescent foam blocks or boards

.6 intumescent spray foam

.8 Systems for miscellaneous electrical penetrations, select one or more of the following fill materials:

.1 latex sealant

.2 intumescent putty

.3 intumescent foam blocks or boards

.4 intumescent spray foam

.9 Systems for miscellaneous mechanical penetrations, select one or more of the following fill materials:

.1 latex sealant

.2 intumescent foam blocks or boards

.3 intumescent spray foam

.10 Systems for groupings of penetrations, select one or more of the following fill materials:

.1 latex sealant

.2 intumescent wrap strips

.3 fire stopping and smoke seal device

.4 intumescent composite sheet

.5 intumescent foam blocks or boards

.6 intumescent spray foam

.3 Design and provide joint fire stopping and smoke seals as follows for:

.1 Floor-to-Floor, Fire-Resistive Joint System: Provide materials to meet the following criteria:

.1 assembly rating: as indicated

.2 nominal joint width: as indicated

.3 movement capabilities: compression and extension

.2 Floor-to-Wall, Fire-Resistive Joint System: Provide materials to meet the following criteria:

.1 assembly rating: as indicated

.2 nominal joint width: as indicated

.3 movement capabilities: to be confirmed, compression, extension, or horizontal shear

.3 Head-of-Wall, Fire-Resistive Joint System: Provide materials to meet the following criteria:

.1 assembly rating: as indicated

.2 nominal joint width: as indicated

.3 movement capabilities: compression and extension

.4 Wall-to-Wall, Fire-Resistive Joint System: Provide materials to meet the following criteria:

.1 assembly rating: as indicated

.2 nominal joint width: as indicated

.3 movement capabilities: compression and extension

.4 Design and provide perimeter fire containment fire stopping and smoke seals as follows for:

.1 Perimeter Fire Containment System: Provide materials to meet the following criteria:

.1 integrity rating: as indicated

.2 insulation rating: as indicated

.3 linear opening width: as indicated

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 07 84 00 – Fire Stopping

.2 Section 09 21 16 – Gypsum Board Assemblies

.3 Section 09 91 00.08 – Painting for Minor Works

.4 Section 01 78 00 – Closeout Submittals

.5 Section 01 61 00 – Common Product Requirements

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM):

- .1 ASTM C834-17, Standard Specification for Latex Sealants
- .2 ASTM C919-19, Standard Practice for Use of Sealants in Acoustical Applications
- .3 ASTM C920-18, Standard Specification for Elastomeric Joint Sealants
- .4 ASTM C1193-16, Standard Guide for Use of Joint Sealants

.2 Canadian General Standards Board (CGSB) 1330:

- .1 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS):

- .1 Safety Data Sheets (SDS)
- .2 Sealant, Waterproofing, and Restoration Institute (SWRI): Sealants: The Professionals' Guide 2013

.4 ULC Standards/ UL Canada (ULC):

- .1 CAN/ULC 115-2018, Standard Method of Fire Tests of Firestop Systems

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

- .1 Submit manufacturer's product data for each type of primer, backer rod, and sealants and include product characteristics, performance criteria, available colours, compatibility warnings, compliance standards and limitations.
- .2 Manufacturer's product to describe:
  - .1 Caulking compound.
  - .2 Primers.

.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.3 Submit one electronic copy of WHMIS SDS.

.4 Samples:

.1 Submit two samples of each type of joint sealant material and colour.

.5 Certificates: When requested by DCC Representative, submit manufacturer's product certificates indicating proposed sealant is appropriate for each application on this Project.

.6 Manufacturer's Instructions:

.1 Submit instructions for each type of product.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data: Submit maintenance data for incorporation into manual.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.2 Manufacturer: Obtain each type of joint sealant from a single manufacturer.

.2 Compatibility: Ensure sealants are compatible with adjacent materials and are approved by manufacture for use with adjacent materials.

.3 Mock-Ups:

.1 Construct mock up in accordance with Section 01 33 00 – Submittal Procedures.

.2 Before performing sealant work do sample applications of each type of sealant for review.

.3 Site locations for sample applications shall be designated by DCC Representative.

.4 Construct joint sealant mock-ups in assemblies of other Sections with joint sealants, which are referenced in this Section.

.5 Construct mock-up to show location, size, shape and depth of joints complete with back-up material, primer, caulking and sealant.

.6 Mock-up will be used:

.7 To judge workmanship, substrate preparation, operation of equipment and material application.

.8 Allow 24 hours for inspection of mock-up by DCC Representative before proceeding with sealant work.

.9 Approved mock-up may remain as part of finished Work.

.4 Comply with requirements of WHMIS regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Safety Data Sheets (SDS) acceptable to Health Canada.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements.

.2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, with manufacturer's label.

.3 Storage and Handling Requirements:

.1 Store materials off ground in a ventilated dry indoor location and in accordance with manufacturer's recommendations.

.2 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.3 Do not dispose of unused sealant material into sewer system, streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.4 Divert unused joint sealing material from landfill to official hazardous material collections site approved by DCC Representative.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Management.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, and packaging material for recycling in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.7 Divert unused joint sealing material from landfill to official hazardous material collections site approved by DCC Representative.

.8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.

.9 Fold up metal banding, flatten, and place in designated area for recycling.

1.8 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 degrees 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 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

.4 DCC Representative will arrange for ventilation system to be operated on maximum outdoor air and exhaust during installation of sealants. Ventilate area of work as directed by DCC Representative by use of approved portable supply and exhaust fans.

1.9 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 Labour Canada.

.2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

1.10 WARRANTY

.1 Manufacturer's warranty: Provide manufacturer's standard warranty documentation.

.2 Warrant that sealant work will not leak, crack, crumble, melt, shrink, run, lose adhesion or stain adjacent surfaces in accordance with General Conditions, except for five years.

.3 Installer's Warranty: Provide an installation warranty, installer agrees to repair or replace joint sealants that do not comply with requirements of this Section for two years from Substantial Performance.

Part 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

.1 When low toxicity sealants are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.2 VOC emissions limits shall be as follows:

.1 Sealant Primers:

.1 non-porous surfaces: 250 g/L

.2 porous surfaces: 775 g/L

.2 Sealants:

.1 architectural: 250 g/L

.3 Each sealant system shall meet the following requirements for warranty period:

.1 Waterproof, flexible, and compatible with substrate under applicable service conditions.

.2 Provide a weather-tight seal that does not allow moisture penetration.

.3 Shall not de-bond, crack, or craze.

.4 Shall not leak.

2.2 SEALANT MATERIALS

.1 In air handling units and supply air system, use sealants without strong odours, without toxic chemicals, and are mould-resistant. When low toxicity sealants are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.2 Provide primers in accordance with manufacturer recommendation.

.3 Colours of Exposed Joint Sealants: As selected by DCC Representative from manufacturer's full range.

.4 Where sealants are qualified with primers use only these primers.

2.3 SEALANT MATERIAL DESIGNATIONS

.1 Type S-1: Acrylic Latex One Part, Shore A Hardness 20,

.2 Type S-2: Silicone Sealant; mould and mildew resistant.

2.4 SEALANT SELECTION

.1 Where no specific type of sealant is scheduled, provide one of the sealants indicated in this Section appropriate for its application and consistent with manufacturer’s recommendations and the recommendations of SWRI, Sealants: The Professionals’ Guide.

.2 Make sealant selections consistent with manufacturer’s recommendations.

.3 Use acrylic sealant Type S-1 only on the interior and only in situations where little or no movement can occur.

.4 Use mould & mildew resistant silicone sealant Type S-2 for nonmoving joints in washrooms and kitchens. Do not use on floors.

2.5 ACCESSORIES

.1 Preformed compressible and non-compressible back-up materials that are non-staining, compatible with joint substrate, sealants, primers, and other joint fillers, and are approved for applications indicated by sealant manufacturer based on site experience and laboratory testing:

.1 Rod Type Sealant Backings:

.1 ASTM C1330, Type C (closed cell material with a surface skin), Type O (open cell material) or Type B (bi cellular material with a surface skin).

.2 Provide any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated.

.3 Size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

.4 Non adhering to sealant, to maintain two-sided adhesion across joint.

.2 High Density Foam:

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by manufacturer.

.3 Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, non absorbent to water and gas, capable of remaining resilient at temperatures down to 15 deg C. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth and otherwise contribute to optimum sealant performance.

.4 Bond Breaker Tape:

.1 Polyethylene bond breaker tape or other tape recommended by sealant manufacturer which will not bond to sealant.

.2 Preformed Sealants:

.1 Preformed Silicone Sealant System: Manufacturer's standard system consisting of pre-cured low modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral curing silicone sealant for bonding extrusions to substrates.

.2 Preformed Hollow Neoprene Gasket: Manufacturer's standard preformed polychloroprene elastomeric joint seal of the open cell compression type complying with ASTM D2628 and with requirements for size, profile and cross-sectional design.

.3 Bond Breaker: Pressure-sensitive plastic tape that will not bond to sealants.

.4 Joint Cleaner: Provide a non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's recommendations

.5 Primer: Provide in accordance with sealant manufacturer's recommendations.

.6 Masking Tape: Non-absorbent type, non-staining, compatible with joint sealant and joint substrates.

2.6 COLOURS

.1 Sealant Colours: Match colour of adjacent materials where visible, as selected by DCC Representative, from manufacturer's standard colour range.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed are acceptable for joint sealants installation in accordance with manufacturer's instructions.

.1 Visually inspect substrate.

.2 Verify joint surfaces are dry and frost free.

.3 Verify substrates are without contaminants capable of interfering with sealant adhesion. Remove contaminants where occurring.

.4 Examine joint sizes and conditions to establish acceptable depth to width ratio for installation of backup materials and application of sealants.

.5 Verify joint widths are within the limits recommended by joint sealant manufacturer for applications indicated.

.6 Inform DCC Representative of unacceptable conditions immediately upon discovery.

.7 Proceed with installation only after unacceptable conditions have been remedied.

3.2 SURFACE PREPARATION

.1 Clean bonding joint surfaces of harmful contaminates including dust, rust, oil grease, and other matter which may impair adhesion.

.2 Do not apply sealants to joint substrates treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.3 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Mask adjacent surfaces prior to priming and sealing where necessary to prevent staining.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately applying sealant, except when manufacturer's instructions explicitly state priming is not required.

.3 Prime all porous material (e.g. wood, masonry, concrete, ceramic or paver tile, etc).

3.4 BACKUP MATERIAL

.1 Provide backer rod as specified, to limit depth of sealant and to act as bond breaker at back of joint.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

.3 Apply paper masking tape to back of joint to act as bond break where depth of joint does not permit the use of backer rod.

.4 Ensure that no joints are formed which are bonded on adjacent sides where there is any possibility of movement.

3.5 MIXING

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

3.6 APPLICATION

.1 Sealant: Application: Apply sealants to recommendations of ASTM C1193, and in accordance with manufacturer's instructions, and as follows:

.1 Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature range.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

.3 For joints where movement is possible, apply backer rod to achieve a joint depth of one half the joint width but not less than 9 mm; for joints larger than 25 mm use a depth of 13 mm

.4 Apply sealant in a continuous beads.

.5 Apply sealant using gun with proper size nozzle.

.6 Fill voids and joints solid.

.7 Form sealant surface with a smooth full bead, without from ridges, wrinkles, sags, air pockets, embedded impurities.

.8 Tool exposed surfaces before skinning begins to give slightly concave shape.

.9 Ensure bead is solid, filling entire space between sides and bedding material, exerting sufficient pressure to obtain maximum bond, by allowing sealant to bulge out in advance of nozzle.

.10 Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature range.

.11 Seal at all locations where dissimilar material meet.

.1 Sealant Curing:

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until after curing has completed.

3.7 CLEANING

.1 .1 Progress Cleaning: Clean in accordance with Section 01 74 00 – Cleaning.

.3 Clean adjacent surfaces immediately of excess primers and sealants.

.4 Remove excess and droppings, using recommended cleaners as work progresses.

.5 Remove masking tape after initial set of sealant.

.2 Final Cleaning and Waste Management: Perform in accordance with Section 01 74 00 – Cleaning & Waste Management upon completion.

.3 Waste Management:

.1 Do not dispose of unused sealant materials into sewer system, streams, lakes, onto ground, or other location where it might pose a health or environmental hazard.

.2 Divert unused sealants from landfill to a hazardous material collection site.

.3 Place materials defined as hazardous or toxic in designated containers.

.4 Dispose of hazardous materials in accordance with the CEPA, TDGA, regional and municipal regulations.

3.8 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by joint sealants installation.

3.9 SCHEDULE

.1 Use acrylic sealant Type S-1 only on the interior and only where little or no movement can occur.

.2 Use mould and mildew-resistant silicone sealant Type S-2 for non-moving joints in washrooms and kitchens. Do not use on floors.

.3 In addition, provide joint sealants at the following conditions:

.4 Seal control joints in gypsum board , except where prefabricated control joints are specified.

.5 Seal joints in floors and walls and around service and mechanical and electrical fixture penetrations.

.6 Perimeter of bath fixtures (e.g., sinks, tubs, urinals, water closets, basins, vanities).

.7 Exposed interior control joints in gypsum board.

.8 Seal at all locations where dissimilar material meet.

.9 Refer to Section 07 84 00 – Fire Stopping for additional requirements.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Gypsum board for interior partition and ceiling assemblies.

.2 Non-load bearing steel stud framing, and suspension systems.

.3 Composite Aluminum Panel Cladding.

1.2 RELATED REQUIREMENTS

.1 Section 07 84 00 – Fire Stopping

.2 Section 07 92 00 – Joint Sealants

.3 Section 09 51 13 – Suspended Acoustic Panel Ceilings

.4 Section 09 91 00.08 – Painting for Minor Works

1.3 REFERENCE STANDARDS

.1 Aluminum Association (AA):

.1 AA DAF 45-03, Designation System for Aluminum Finishes

.2 ASTM International (ASTM):

.1 ASTM C473-19, Standard Test Methods for Physical Testing of Gypsum Panel Products

.2 ASTM C475/C475M-17, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board

.3 ASTM C514-04, Standard Specification for Nails for the Application of Gypsum Board

.4 ASTM C645-14e1, Standard Specification for Non-structural Steel Framing Members.

.5 ASTM A653/A653M-20, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.

.6 ASTM C754-20, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

.7 ASTM C840-18b, Standard Specification for Application and Finishing of Gypsum Board

.8 ASTM C954-18, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness

.9 ASTM C1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

.10 ASTM C1047-19, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base

.11 ASTM C1178/C1178M-18, Standard Specification for Glass Mat Water-Resistant Gypsum

Backing Board

.12 ASTM C1280-13, Standard Specification for Application of Gypsum Sheathing

.13 ASTM C1396/C1396M-17, Standard Specification for Gypsum Board

.14 ASTM C1629/C1629M-23, Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction

.4 Gypsum Association (GA):

.1 GA-214-2021, Levels of Finish for Gypsum Panel Products

.2 GA-801-2023, Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors

.5 ULC Standards (ULC):

.1 CAN/ULC-S101-14, Standard Method of Fire Endurance Tests of Building Construction and Materials

.2 CAN/ULC-S102-10, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies

.6 Underwriter's Laboratories (UL)

.1 UL-2768-2011, Architectural Surface Coatings.

.7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Coordinate with Section 09 91 00.08 – Painting for Minor Works for paint gloss levels that require a Level 5 gypsum board finish.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data: Product literature and data sheets, including product characteristics, performance criteria, physical sizes, and limitations.

.1 Submit product data for:

.1 gypsum board and panel materials

.2 joint tapes

.3 joint compounds

.4 casing beads

.5 corner beads

.6 control joints

.7 edge trims

.8 cornice caps

.9 mouldings

.10 non-structural metal framing

.2 Submit ULC fire-resistance assembly listings for each fire-rated assembly indicated in the Contract Documents.

.3 Shop Drawings:

.1 Indicate components, including fastener types, dimensions, spacing, locations at gypsum board edges, ends, and infield of board, and installation methods.

.2 Show locations and sizes of blocking and nailers. Include concealed blocking and reinforcement specified in other sections.

.3 Indicate type of joint compound, and number of joint compound layers.

.4 Indicate quantities and locations of electrical boxes for walls and ceilings.

.5 Composite Aluminum Panels: Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants, and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.

.4 Samples:

.1 Samples for initial selection: Full range of samples, representing available colours, patterns, textures, and finishes.

.2 Submit samples for:

.1 each predecorated gypsum board

.2 each exposed control joint

.3 each exposed edge trim

.4 each exposed cornice cap

.5 each exposed shadow mould

.6 each exposed moulding

.7 Duplicate 150 mm long sample of each specified special trim.

.8 Composite Aluminum Panels:

.1 Manufacturer’s standard list of colour and finishes

.2 Two samples of each color or finish selected, 76mm x 102mm minimum

.9 Submit duplicate 300 mm long samples of non-structural metal framing.

.5 Manufacturer's instructions:

.1 Special delivery, storage, and handling requirements.

.2 Installation instructions.

.3 Recommended sequencing.

.4 Cleaning procedures.

1.6 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

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

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:

.1 Comply with GA-801 when handling or storing gypsum panel products.

.2 Carefully unload gypsum board shipment to prevent damage to edges and corners.

.3 Store and protect gypsum board materials from scratches, condensation, excessive humidity, and water damage.

.4 Handle gypsum boards to prevent damage to edges, ends, and surfaces.

.5 Protect ready-mix joint compounds from freezing, exposure to extreme heat, and direct sunlight.

.6 Protect prefinished aluminum surfaces with wrapping or strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

.7 Waste management and disposal requirements: Refer to Section 01 74 00 – Cleaning and Waste Management

1.8 SITE CONDITIONS

.1 Ambient Conditions: Maintain environmental conditions in accordance with ASTM C840 and:

.1 Ventilate application areas, immediately after apply joint treatments, to remove excess moisture that might prevent proper drying of joints.

Part 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

.1 Fire-resistance-rated assemblies: Provide materials identical to those in indicated assemblies tested in accordance with CAN/ULC-S101 by an independent testing agency.

.2 Design components for work of this Section requiring structural performance. Determine sizes, yield strengths, base steel thicknesses and joint spacing to allow thermal movement and loading of components in accordance with applicable codes and regulations.

2.2 FRAMING MATERIALS

.1 Non-load bearing channel stud framing: to ASTM C645, roll formed from 0.53 mm thickness hot dipped zinc-coated galvanized steel sheet in accordance with ASTM A653, Z180, for screw attachment of gypsum board.

.1 Knock-out service holes at 460 mm centres.

.2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, and as follows:

.1 Slotted Deflection Track for Fire Separations: Premanufactured slotted top runner with 63 mm down standing legs and having 6 mm wide x 38 mm high slots spaced at 25 mm on centre along length of runner; tested and certified for use in fire rated wall construction.

.2 Deep Leg Deflection Track: Top runner having 50 mm down standing legs; maintaining 13 mm minimum deflection space.

.3 Base Runner: Bottom track with 33 mm upstanding legs.

.3 Furring Channels: Commercial steel sheet in accordance with ASTM A653, Z180, hot dipped zinc-coated (galvanized), as follows:

.1 Hat Shaped, Rigid Furring Channels: ASTM C645, 0.75 mm thickness x 22 mm deep

2.3 PANEL MATERIALS

.1 Standard board: to ASTM C1396/C1396M Type X, 16 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges squared.

.2 Composite Aluminum Panels

.1 Thickness: 4mm

.2 Product Performance:

.1 Bond Integrity: When tested for bond integrity, in accordance with ASTM D1781 (simulating resistance to panel delamination), there shall be no adhesive failure of the bond a) between the core and the skin nor b) cohesive failure of the core itself below the following values.

.2 Peel Strength: 115 N mm/mm (22.5 in lb/in) as manufactured

.3 Fire Performance:

.1 ASTM E 84, Flame Spread Index must be less than 25, Smoke Developed Index must be less than 450

.1 ASTM D 1929, A self ignition temperature of 650^{o}F or greater

.2 ASTM D-635, Requires a CC1 Classification

.3 Finishes:

.1 Anodized: Color (Clear): AA-C22-A41 Architectural Class I

.4 Fabrication:

.1 Composition: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

.2 Aluminum Face Sheets:

.1 Thickness: 0.50mm Nominal

.3 Tolerances:

.1 Panel Bow: Maximum 0.8% of any 1828mm (72") panel dimension.

.1 Panel Dimensions: Field fabrication shall be allowed where necessary but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.

.2 Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.

.3 Maximum deviation from panel flatness shall be 3mm in 1524mm on panel in any direction for assembled units.

.1 System Characteristics:

.1 System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.

.2 System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.

.3 Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 21 degrees C.

.4 Fabricate panel system so that no restraints can be placed on the panel, which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature change and at all times remain air and watertight.

.4 System Type:

.1 Route and Return Wet: System must provide a wet seal (caulked) reveal joint as detailed on drawings. The sealant type shall be as per manufacturer's recommendations with foamed type backer rod.

2.4 SUSPENSION SYSTEMS

.1 Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 1.59-mm- diameter wire, or double strand of 1.21-mm- diameter wire.

.2 Hanger Attachments to Concrete:

.1 Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

.3 Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 4.12 mm in diameter.

.4 Flat Hangers: Steel sheet, minimum 25 by 5 mm by length required.

.5 Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 1.34 mm and minimum 13-mm- wide flanges.

.6 Furring Channels (Furring Members):

.1 Cold-Rolled Channels: 1.34-mm uncoated-steel thickness, with minimum 13-mm- wide flanges, 19 mm deep.

.2 Steel Studs: to ASTM C645.

2.5 GYPSUM BOARD MATERIALS

.1 Acceptable Manufacturers

.1 CGC Inc. (CGC).

.2 CertainTeed Gypsum Canada Inc. (CertainTeed).

.3 Georgia-Pacific Gypsum LLC. (Georgia-Pacific).

.2 Gypsum ceiling board: To ASTM C1396/C1396M, regular and Type X.

.4 Board size: 1220 mm wide x maximum practical lengths to suit application lengths.

.5 Board thickness: 12.7 mm.

.6 Long edges: Square.

.7 Surface burning characteristics: To CAN/ULC-S102.

.1 Flame-spread rating: 0 maximum.

.2 Smoke developed classification: 0 maximum.

.2 Water-resistant gypsum backing board: To ASTM C1396/C1396M, regular and Type X, with water-repellant paper surfaces and water-resistant core.

.1 Board size: 1220 mm wide x maximum practical lengths to suit application lengths.

.2 Board thickness: As indicated on Drawings.

.3 Long edges: Bevelled.

.3 Abuse-resistant gypsum board: To ASTM C1396/C1396M, Type X, with superior resistance to surface damage and indentation than standard gypsum board.

.1 Board size: 1220 wide x maximum practical lengths to suit application lengths.

.2 Board thickness: 15.9 mm.

.3 Long edges: Bevelled.

.4 Surface burning characteristics: To CAN/ULC-S102.

.1 Flame-spread rating: 0 maximum.

.2 Smoke developed classification: 0 maximum.

.5 Performance/design characteristics: To ASTM C1629/C1629M.

.1 Surface abrasion resistance: Classification level 2, 1.5 mm.

.2 Indentation resistance: Classification level 1, 3.8 mm.

.3 Soft body impact: Classification level 2, 265 J.

.4 Hard body impact: Classification level 1, 68 J.

2.6 PANEL MATERIALS

.1 Composite Aluminum Panels

.1 Thickness: 4mm

.2 Product Performance:

.1 Bond Integrity: When tested for bond integrity, in accordance with ASTM D1781 (simulating resistance to panel delamination), there shall be no adhesive failure of the bond a) between the core and the skin nor b) cohesive failure of the core itself below the following values.

.2 Peel Strength: 115 N mm/mm (22.5 in lb/in) as manufactured

.3 Fire Performance:

.1 ASTM E 84, Flame Spread Index must be less than 25, Smoke Developed Index must be less than 450

.2 ASTM D 1929, A self ignition temperature of 650°F or greater

.3 ASTM D-635, Requires a CC1 Classification

.3 Finishes:

.1 Anodized: Color (Clear): AA-C22-A41 Architectural Class I

.4 Fabrication:

.1 Composition: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

.2 Aluminum Face Sheets:

.1 Thickness: 0.50mm Nominal

.3 Tolerances:

.1 Panel Bow: Maximum 0.8% of any 1828mm (72”) panel dimension.

.2 Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.

.3 Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.

.4 Maximum deviation from panel flatness shall be 3mm in 1524mm on panel in any direction for assembled units.

.4 System Characteristics:

.1 System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.

.2 System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.

.3 Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 21 degrees C.

.4 Fabricate panel system so that no restraints can be placed on the panel, which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature change and at all times remain air and watertight.

.5 System Type:

.1 Route and Return Wet: System must provide a wet seal (caulked) reveal joint as detailed on drawings. The sealant type shall be as per manufacturer's recommendations with foamed type backer rod.

2.7 ACCESSORIES

.1 Miscellaneous framing: to ASTM C1280, galvanized.

.1 Furring channels

.2 Furring hangers

.3 Tie wires

.4 Inserts

.5 Anchors

.2 Nails: To ASTM C514.

.3 Steel screws:

.1 Fastening gypsum board to wood supports: To ASTM C1002, type W course-thread screws.

.2 Fastening gypsum board to steel members less than 0.84 mm: To ASTM C1002, type S fine thread screws.

.3 Fastening gypsum board to steel members from 0.84 mm to 2.84 mm thick: To ASTM C954.

.4 Fastening gypsum board to gypsum board (two-layer applications): To ASTM C1002, type G course-pitch high-thread self-piercing screws.

.4 Laminating compound: Adhesive as recommended by manufacturer for directly adhering gypsum panels to continuous substrate, asbestos-free.

.5 Joint tape: To ASTM C475/C475M, as recommended by manufacturer for application type. Use mould-resistant tape for moisture-resistant boards.

.6 Joint compound: To ASTM C475/C475M, as recommended by the manufacturer for application type.

.7 Casing beads, corner beads, control joints, and edge trim: To ASTM C1047, zinc-coated steel, minimum 0.5 mm base thickness, perforated flanges, one piece length per location.

.8 Cornice caps: 12.7 mm deep x partition width, of 1.6 mm base thickness galvanized sheet steel, prime painted Include splice plates for joints.

.1 Colour: As selected by the DCC Representative from manufacturer's standard colour range.

.9 Sealants: in accordance with Section 07 92 00 – Joint Sealants.

.10 Composite Aluminum Panels:

.1 Extrusions, formed members, sheet, and plate shall conform with ASTM B209 and the

recommendations of the manufacturer.

.2 Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.

.3 Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet performance requirements.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of conditions:

.1 Verify substrate and project conditions in accordance with Section 01 71 00 – Examination and Preparation, and:

.1 Visually inspect substrate in presence of DCC Representative.

.2 Inform DCC 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 DCC Representative.

.4 Verify substrates are dry, clean, and frost free.

.5 Verify substrates are installed in accordance with ASTM C840.

.6 Verify substrate tolerances are suitable to achieve specified finished assembly tolerances.

.7 Verify bucks, anchors, blocking, and sound attenuation materials are installed.

.8 Verify work to be concealed has been reviewed and inspected by authority having jurisdiction (AHJ) (if required) and corrective work is completed, if any.

3.2 GENERAL INSTALLATION REQUIREMENTS

.1 Fire-resistance-rated assemblies: Provide construction identical to that in indicated assemblies tested in accordance with CAN/ULC-S101 by an independent testing agency.

3.3 ERECTION - FRAMING

.1 Erect partitions in accordance with framing requirements of ASTM C754

.2 Align partition tracks at floor and ceiling and secure at 610 mm on centre maximum.

.3 Install damp proof course under stud shoe tracks of partitions on slabs on grade.

.4 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.

.5 Erect metal studding to tolerance of 1:1000.

.6 Attach studs to bottom track only for walls extending to underside of structure using screws. Attach studs to bottom and ceiling track for walls not extending to underside of structure.

.7 Co-ordinate simultaneous erection of studs with installation of service lines. Align web openings when erecting studs.

.8 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.

.9 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.

.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, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.12 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.13 Extend partitions to ceiling height except where noted otherwise on drawings.

.14 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.

.15 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

.16 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, and ducts, in partitions where perimeter sealed with acoustic sealant.

3.4 CEILINGS AND BULKHEADS

.1 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.

.2 Install work level to tolerance of 1:1200.

.3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.4 Frame perimeter of openings for access panels, light fixtures, diffusers, grilles and other openings with furring channels.

.5 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

.6 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.7 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated. Extend gypsum board to underside of structure except where indicated otherwise. Allow for 25 mm deflection.

.8 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.

.9 Furr openings and around built-in equipment, cabinets, access panels, and other equipment or accessories, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.10 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

3.5 GYPSUM BOARD ASSEMBLY INSTALLATION

.1 Install gypsum board in accordance with ASTM C840.

.2 Install gypsum sheathing to ASTM C1280.

.3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C 840 except where specified otherwise.

.4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.5 Install work level to tolerance of 1:1200.

.6 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

.7 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.8 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.9 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.

.10 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

.11 Secure gypsum board to framing without damaging gypsum board edges or ends.

.12 Apply single layer gypsum board to metal furring or framing using screw fasteners. Maximum screw spacing 300 mm on-centre.

.1 Single-layer application:

.1 Apply gypsum board on walls vertically or horizontally, providing sheet lengths to minimize number of board edges or end joints.

.13 Install ceiling boards in direction to minimize number of end-butt joints. Stagger end joints at least 250 mm.

.14 Apply water-resistant gypsum board where wall tiles are to be applied. Apply water-resistant sealant to edges, ends, and cut-outs which expose gypsum core, and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

.15 Install gypsum board with face side outwards.

.16 Do not install damaged or damp boards, or boards with evidence of mould growth.

3.6 ACCESSORY INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure using contact adhesive for full length.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces without trim concealing junction and where indicated. Seal joints with sealant.

.4 Install mouldings and trim where indicated

.5 Control joints:

.1 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.

.2 Provide continuous polyethylene dust barrier behind and across control joints.

.3 Locate control joints at changes in substrate construction at maximum 9 m spacing on partitions and ceilings and at maximum 15 m spacing on ceilings without perimeter relief.

.4 Locate control joints to coincide with the corner of a door, window, or screen frame where possible.

.5 Install control joints straight and true.

.6 Expansion joints:

.1 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.

.2 Install expansion joint straight and true.

.3 Construct control and expansion joints to maintain sound-rated construction and fire ratings.

.7 Install cornice caps where gypsum board partitions do not extend to ceiling. Fit cornice caps over partition, secure to partition top track with two rows of sheet metal screws staggered at 300 mm on-centre.

.8 Splice corners and intersections together and secure to each member with three screws.

.9 Install access doors to electrical and mechanical fixtures specified in respective sections as specified in respective sections.

.1 Rigidly secure frames to furring or framing systems.

3.7 FINISHING

.1 Finish face panel joints and interior angles with joint system consisting of joint compound, joint tape, and taping compound installed in accordance with manufacturer's instructions and feathered out onto panel faces.

.2 Gypsum Board Finish: Finish gypsum board walls and ceilings to the following levels in accordance with ASTM C840 or GA-214.

.3 Where a fire resistance rating is required for the gypsum board assembly, details of construction and finishing shall be in accordance with reports of fire test assemblies that have met the fire-rating requirement, regardless of finish level specified below.

.4 Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

.1 Levels of finish:

.1 Level 0: No taping, finishing, or accessories required.

.1 Locations:

.1 temporary construction

.2 behind solid paneling where fire or smoke seal is not required.

.2 Level 1: Joints and interior angles to have tape embedded in joint compound. Excess joint compound, tool marks, and ridges are acceptable.

.1 Locations:

.1 joint treatment in smoke barrier applications

.2 gypsum board in areas not normally open to public view including plenum areas above ceilings and similar concealed locations

.3 Level 2: Joints and interior angles to have tape embedded in joint compound and immediately wiped clean with a joint knife or trowel leaving a thin coating of joint compound over the joints and interior angles. Cover fastener heads and accessories with a coat of joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable.

.1 Locations:

.1 gypsum board is to receive tile

.4 Level 3: Joints and interior angles to have tape embedded in joint compound and immediately wiped clean with a joint knife or trowel leaving a thin coating of joint compound over the joints and interior angles. Apply one additional coat of joint compound over joints and interior angles. Cover fastener heads and accessories with two separate coats of joint compound. Surfaces to be smooth and free of tool marks and ridges.

.1 Locations:

.1 gypsum board to receive medium-or heavy-texture finishes

.2 gypsum board to receive heavy-duty or commercial-grade wall coverings

.5 Level 4: Embed tape for joints and interior angles in joint compound and immediately wiped clean with a joint knife or trowel leaving a thin coating of joint compound over the joints and interior angles. Apply two separate coats of joint compound over flat joints. Apply one separate coat of joint compound over interior angles. Cover fastener heads and accessories with three separate coats of joint compound. Surfaces to be smooth and free of tool marks and ridges.

.1 Locations:

.1 gypsum board to receive wall coverings.

.2 gypsum board to receive a light texture finish.

.6 Level 5: Embed tape for joints and interior angles in joint compound and immediately wiped clean with a joint knife or trowel leaving a thin coating of joint compound over the joints and interior angles. Apply two separate coats of joint compound over flat joints. Apply one separate coat of joint compound over interior angles. Cover fastener heads and accessories with three separate coats of joint compound. Apply a thin skim coat of joint compound or a material manufactured especially for this purpose to the entire surface. Surfaces to be smooth and free of tool marks and ridges.

.1 Locations: As indicated on Drawings.

.1 Exposed painted gypsum board surfaces

.5 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent uncoated surface of gypsum board.

.6 Skim coating:

.1 Mix joint compound slightly thinner than for joint taping.

.2 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations, or tool marks.

.3 Allow skim coat to dry completely.

.4 Remove ridges by light sanding or wiping with damp cloth.

.7 Tolerances: Maximum variation of finished gypsum board surface from true flatness: 3 mm in 3000 mm in any direction.

3.8 INSTALLATION – COMPOSITE ALUMINUM PANELS

.1 Inspection:

.1 Surfaces to receive panels shall be even, smooth, sound, clean, dry and free from defects detrimental to work.

.2 Installation:

.1 Erect panels plumb, level, and true.

.2 Panels shall be erected in accordance with an approved set of shop drawings.

.3 Do not install component parts that are observed to be defective, including warped, bowed, dented, abraised, and broken members.

.4 Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement with new parts.

.5 Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

.3 Adjusting and Cleaning:

.1 Remove and replace panels damaged beyond repair as a direct result of the panel installation.

.2 Repair panels with minor damage.

3.9 CLEANING

.1 Clean in accordance with Section 01 74 00 – Cleaning & Waste Management.

.2 Waste management:

.1 Manage waste in accordance with Section 01 74 00 – Cleaning & Waste Management.

3.10 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by non-structural metal framing application.

3.11 SCHEDULES

.1 Construct fire rated assemblies where indicated, and to ULC Design number as noted on Drawings.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 09 21 16 Gypsum Board Assemblies

.2 Section 21 13 13 – Wet Pipe Sprinkler Systems (specifically sprinkler heads in acoustical panel ceilings)

.3 Section 21 13 16 – Dry Pipe Sprinkler Systems (specifically sprinkler heads in acoustical panel ceilings)

1.2 DEFINITIONS

.1 Articulation Classification (AC): Indication of attenuation of sound being reflected from ceiling materials to adjacent areas in open plan areas, in accordance with ASTM E1111/E1111M.

.2 Ceiling Attenuation Class (CAC): Indication of amount of attenuation of sound passing up through a panel through the open plenum and back down through a panel into adjacent spaces where a partition is not full height, in accordance with ASTM E1414/E1414M.

.3 Light Reflectance (LR): The percentage amount of light returned from the surface of a material compared to the source.

.4 Noise Reduction Coefficient (NRC): Measure of the absorption of sound energy over four frequencies. An indication of the amount of noise a panel can absorb-measured in 0.05 increments in accordance with ASTM C423.

.5 Sound Absorption Average (SAA): Measure of the absorption of sound energy over twelve frequencies. An indication of the amount of sound a panel can absorb-measured in 0.01 increments in accordance with ASTM C423.

1.3 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM C423-17, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

.2 ASTM C635/C635M-17, Standard Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings

.3 ASTM C636/C636M-19, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels

.4 ASTM E580/E580M-20 Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions

.5 ASTM E1264-19, Standard Classification for Acoustical Ceiling Products

.6 ASTM F1667-18a Standard Specification for Driven Fasteners: Nails, Spikes and Staples

.2 Ceilings & Interior Systems Construction Association (CISCA):

.1 Ceiling Systems Handbook, 2019

.2 Seismic Construction Handbook, 2018

.3 CSA Group (CSA):

.1 CSA S832-14, Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings

.4 ULC Standards (ULC):

.1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.4 COORDINATION

.1 Do not begin installation of ceiling suspension system until work above ceiling has been reviewed by DCC Representative.

.2 Coordinate ceiling work to accommodate components of other Sections built into acoustical ceilings, including the following:

.1 Section 21 13 13 – Wet Pipe Sprinkler Systems (specifically sprinkler heads in acoustical panel ceilings)

.2 Section 21 13 16 – Dry Pipe Sprinkler Systems (specifically sprinkler heads in acoustical panel ceilings)

1.5 SEQUENCING

.1 Schedule installation of acoustical panel ceilings to occur after completion of overhead mechanical and electrical work.

.2 Begin installation after dust and moisture producing activities are complete, and paint is dry.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data: Submit manufacturer's installation instructions, product literature, and data sheets for ceiling suspension system, acoustic panels, and system accessories. Include product characteristics, performance criteria, physical sizes, finishes, and limitations.

.3 Shop Drawings:

.1 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, change in level details lateral bracing and accessories.

.4 Samples for Initial Selection:

.1 Submit actual samples of acoustical panel that are 150 mm x 150 mm showing full range of colours, textures, and patterns available.

.2 Submit samples that are approximately 200 mm long of each ceiling suspension system component exposed to view showing full range of profiles, colours, and gloss levels.

.5 Samples for Verification:

.1 Submit duplicate 150 mm x 100 mm samples of each type of acoustical panel.

.2 Submit for review and acceptance of each component specified or necessary for complete installation. Include technical descriptive data.

.3 Submit samples of each component proposed for use in each type of ceiling suspension system.

.6 Delegated Design Submittals:

.1 Submit delegated design shop drawings stamped and signed by professional engineer licensed in Province of Ontario, Canada.

.2 Indicate that components and installation methods conform to specified seismic design and construction requirements of Contract Documents and in accordance with ASTM E580/E580M.

.3 Include supporting details, treatment of cross runners, main runners, and wall closures at terminal ends, suspension wire, lateral force bracing, light fixtures, services within the ceiling, seismic isolation joints, and partition bracing.

.7 Test Reports: Submit test data indicating that fasteners and anchors used to suspend ceiling systems have a minimum capacity of 890 N in tension, and anchors to attach bracing wires have minimum a capacity of 1960 N in tension.

1.7 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Submit maintenance information for acoustical ceiling systems and incorporate into manual. Include warnings of cleaning methods that may damage finished surfaces.

1.8 MAINTENANCE MATERIAL SUBMITTALS

.1 Supply extra acoustical units in accordance with Section 01 78 00 – Closeout Submittals.

.2 Supply extra materials from same production run as installed materials.

.3 Supply acoustical units amounting to 2% of gross ceiling area for each pattern and type of acoustical panel, ceiling suspension system and trim required for Project-minimum one complete factory-sealed package of each.

1.9 QUALITY ASSURANCE

.1 Certifications:

.1 Submit manufacturer’s product certificates, certifying materials comply with specified performance criteria and physical requirements.

.2 Manufacturers: Obtain materials for each type of acoustical panel ceiling system (panels and suspension system) from a single manufacturer. Provide products exposed to view from the same production run for each room, with consistent appearance.

1.10 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements.

.2 Storage and Handling Requirements:

.1 Store materials flat, off ground, indoors, and in a clean, dry, and well-ventilated area.

.2 Protect acoustical ceiling components from nicks, scratches, and other damage.

1.11 AMBIENT CONDITIONS

.1 Unless manufacturer's recommendations are more restrictive, maintain uniform temperature of 15 to 29 degrees C and relative humidity of 20 to 40% for 48 hours before and during installation.

.2 Store materials in work area 48 hours before beginning installation.

1.12 WARRANTY

.1 Manufacturer Warranty:

.1 Coverage of manufacturing defects in materials and workmanship resulting in failure of suspension system for 30 years from date of Substantial Performance.

Part 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

.1 Fire-Resistance Rated Acoustic Panel Ceilings: Meeting requirements of CAN/ULC-S102, labelled and listed by ULC Standards, Warnock Hersey Intertek (WHI), or another testing and inspecting agency acceptable to authorities having jurisdiction (AHJ).

2.2 DESIGN CRITERIA

.1 Superimposed Loads: Determine superimposed loads applied to ceiling suspension systems by components of the building and verify that adequate hangers are installed to support additional loads in conjunction with normal loads of the ceiling system, and as follows:

.1 Maximum Deflection: Limit deflection to L/360 in accordance with ASTM C635/C635M deflection test.

.2 Seismic Restraints: Design system to withstand seismic forces in accordance with CSA S832 and as outlined in applicable Building Code for normal Importance Category facilities based on a full uniform ceiling load acceleration in accordance with ASTM A580/A580M. Ceiling areas less than 13.4 m^2 and surrounded by walls connected to structure above do not require seismic restraints.

2.3 MATERIALS

.1 General

.1 Acceptable products: Suspended acoustical ceilings by one of the following manufacturers:

.1 Armstrong.

.2 USG/CGC.

.3 Certainteed.

.2 Requests for substitutions will be considered in accordance with provisions of DCC Instructions to Tenderers. Acceptance of alternative products is subject to the approval of the DCC Representative.

.3 Source limitations:

.1 Obtain each type of ceiling panel from a single source, from single manufacturer.

.2 Obtain each type of suspension system from single source from single manufacturer.

.2 Classification: Intermediate-Dutysystem to ASTM C635/C635M

2.4 ACOUSTICAL CEILING SUSPENSION

.1 Ceiling Suspension System: Non-fire rated, made up as follows:

.1 Two- directional exposed tee-bar grid, consisting of die cut components as follows:

.2 Main tees: 24 mm rolled cap on exposed face, double web, rectangular bulb, 38 mm deep minimum, cross tee holes 152 mm o.c., integral, reversible splices.

.3 Cross tees: 24 mm rolled cap on exposed face, rectangular bulb, 32 mm deep minimum, extended web positive interlock to main tee web, lower flange extended, and offset to provide flush intersection.

.4 Edge mouldings, and trim: manufacturer's standard to match exposed grid components, uniform width, complete with back up plates.

.5 Finish: satin sheen white.

.6 Minimum 25% recycled content; recycled content to be quantified as postconsumer recycled content + 1/2 pre-consumer recycled content.

.7 Acceptable products:

.1 Armstrong Prelude.

.2 CGC DX/DXL

.3 Certainteed Classic Stab.

.2 Materials for Suspension System: commercial quality cold rolled steel, hotdip galvanized.

.3 Hanger Wire: To ASTM A641/A641M, galvanized soft annealed steel wire:

.1 Access Panel Ceilings: Minimum 3.6-mm diameter

.2 Other Ceilings: Minimum 2.6-mm diameter

.4 Hanger rod: minimum 4.8 mm diameter, zinc coated mild steel pencil rod.

.5 Hanger Inserts: Purpose made.

.6 Accessories: Splices, clips, wire ties, retainers and wall moulding flush or reveal to suit tile edge, to complement suspension system components, and as recommended by system manufacturer.

2.5 ACOUSTICAL CEILING PANELS

.1 Acoustical Panels: To ASTM E1264 and as follows:

.1 Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

.2 Provide product with minimum 25% recycled content. Recycled content to be quantified as post-consumer + 1/2 preconsumer recycled content.

.3 Glass Fibre-Based Panels: Made with binder containing no added urea formaldehyde.

.4 Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance unless otherwise indicated.

.5 General: Subject to compliance with requirements, provide products by one of the following manufacturers:

.1 Armstrong

.2 USG/CGC.

.3 Certainteed.

.6 Pattern Description: E-Lightly textured, non-perforated, non fissured

.7 Surface Burning Characteristics: To CAN/ULC-S102:

.1 Flame-Spread Rating: 25 or less.

.2 Smoke Developed Classification: 50 or less.

.8 Noise Reduction Coefficient (NRC): Minimum 0.55 to ASTM C423.

.9 Ceiling Attenuation Class (CAC) Rating: 35., to ASTM E1414/E1414M.

.10 Light Reflectance (LR): not less than 0.86 to ASTM E1477.

.11 Panel Edge Type: Square-lay in edge.

.12 Colour: White

.13 Panel Size: 610 mm x 610mm .

.14 Panel Thickness: As required to meet specified performance values

.15 Panel Shape: Flat

.16 Acceptable products:

.1 Armstrong Ultima.

.2 CGC Astro, ClimaPlus.

.3 Certainteed, Cashmere.

2.6 ACCESSORIES

.1 Metal Edge Moulding and Trim System

.1 Provide product with minimum 25% recycled content. Recycled content to be quantified as post-consumer + 1/2 pre-consumer recycled content.

.2 Roll-Formed, Sheet-Metal Edge Mouldings and Trim: manufacturer's standard mouldings for edges and penetrations; formed from sheet metal of same material, finish, and colour as that used for exposed flanges of suspension-system runners.

.1 For lay-in panels with reveal edge details, provide stepped edge moulding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verify substrate conditions are acceptable for installation of acoustical ceiling panel and suspension system in accordance with manufacturer’s instructions.

.1 Visually inspect substrates in presence of DCC Representative.

.2 Inform responsible Subcontractor(s) and DCC Representative of unacceptable conditions in writing of conditions detrimental to the proper and timely condition of work, immediately upon discovery.

.3 Proceed with installation after unacceptable conditions are remedied and after receipt of written approval to proceed from DCC Representative.

.4 Do not erect ceiling suspension system until anchors, blockings, sound and fire barriers, mechanical and electrical work above ceiling has been installed and reviewed by the DCC representative.

3.2 INSTALLATION-SUSPENSION SYSTEM

.1 Comply with manufacturer's installation instructions and recommendations, including product technical bulletins, installation instructions, and data sheets.

.2 Install suspension system in accordance with accepted shop drawings, Certification Organizations tested design requirements and ASTM C636/C636M except where specified otherwise.

.3 Install suspension system by suspending ceiling hangers from building's structural members, and as follows:

.1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

.2 Attach hangers to structural members or intermediate structural supports.

.3 Fasten hangers to cast-in-place hanger inserts, powder actuated fasteners, or drilled in anchors that extend through forms into concrete.

.4 Splay hangers only where required to miss obstructions. Offset resulting horizontal forces by bracing or counter-splaying.

.4 Lay out system according to reflected ceiling plan, and to match existing ceiling grid layout.

.5 Installation Tolerances: Finished ceiling system square with adjacent walls and level within 1:1000.

.6 Secure hangers to overhead structure using attachment methods acceptable to DCC Representative.

.7 Install hangers spaced at a maximum 1200 mm on centre and within 150 mm from ends of main tees.

.8 Coordinate suspension system with location of related components. Provide carrying channels as necessary to bridge at unavoidable interference between suspension system and other work above ceiling.

.9 Install wall moulding to provide correct ceiling height.

.10 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers, grilles and speakers.

.11 Support light fixtures and diffusers with additional ceiling suspension hangers within 150 mm of each corner and at a maximum 610 mm around perimeter of fixture.

.12 Interlock or attach cross member to main runner to provide rigid assembly.

.13 Frame at openings for light fixtures, air diffusers, speakers, and at changes in ceiling heights.

3.3 INSTALLATION-ACOUSTICAL CEILING PANEL SYSTEM

.1 Install lay-in acoustical panels in ceiling suspension system in accordance with manufacturer's instructions and as indicated.

.2 Install panels with edges fully hidden from view by flanges of suspension system runners and mouldings.

.3 In fire-rated ceiling systems, secure lay-in panels with hold-down clips and protect over light fixtures, diffusers, air return grilles and other appurtenances according to Certification Organizations design requirements.

.4 Neatly cut panels as required to accommodate sprinkler heads, light fixtures and other ceiling-mounted fixtures and fittings. Provide trim at cute edges of panels.

.5 Scribe acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding.

.6 Do not use scratched, damaged or broken units. Replace as required.

3.4 INTERFACE WITH OTHER WORK

.1 Coordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into ceiling components.

.2 Centre light fixtures, diffusers, speakers, and sprinkler heads in ceiling components.

3.5 SITE QUALITY CONTROL

.1 Site Tests and Inspections: Arrange for periodic site visits by design professional responsible for delegated ceiling design work to review installed work for conformity to design.

3.6 CLEANING

.1 Progress Cleaning: In accordance with Section 01 74 00 – Cleaning.

.2 Final Cleaning: In accordance with Section 01 74 00 – Cleaning, and touch-up scratches,

abrasions, voids, and other defects in painted surfaces.

3.7 PROTECTION

.1 Protect installed products from damage during construction.

.2 Repair damage to adjacent materials caused by acoustical suspension installation.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCE STANDARDS

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.2 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual-current edition.

.2 Maintenance Repainting Manual-current edition.

.3 National Research Council Canada (NRC)

.1 National Building Code of Canada 2020 (NBC).

.4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2007, Architectural Coatings.

1.3 ACTION AND INFORMATIONAL 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 paint and coating products and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit electronic copy of WHMIS SDS in accordance with Section 01 35 43 – Environmental Procedures.

.3 Samples:

.1 Submit for review and acceptance of each unit.

.2 Samples will be returned for inclusion into work.

.3 Submit 200 x 305 mm sample panels of each paint with specified paint in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards.

.4 Certificates:

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

.5 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements per Section 01 35 43 Environmental Protection

1.4 QUALIFICATIONS

.1 Maintain a current and valid Applicator Certification Standard (ACS) certification during project period.

.1 Application specialists who perform surface preparation and coating application work on this project must have a current ACS.

.2 Notify DCC Representative of any change in application specialist certification status.

.1 Any delays to the completion of the Project due to invalid certifications will not be considered, and liquidated damages shall not be waived for any non-performance by Contractor.

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 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 Provide and maintain dry, temperature controlled, secure storage.

.2 Store painting materials and supplies away from heat generating devices.

.3 Store materials and equipment in well ventilated area within temperature as recommended by manufacturer.

.4 Fire Safety Requirements:

.1 Supply 1 9 kg Type A 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 (NFC) requirements.

1.6 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces in accordance with Section 01 51 00 – Temporary Utilities

.2 Coordinate use of existing ventilation system with DCC Representative and ensure its operation during and after application of paint as required.

.3 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.

.2 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.

.3 Additional application requirements:

.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 Schedule operations to approval of DCC Representative=such that painted surfaces will have dried and cured sufficiently before occupants are affected.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Supply paint materials for paint systems from single manufacturer.

.2 Conform to latest MPI requirements for painting work including preparation and priming

.3 Materials in accordance with MPI-Architectural Painting Specification Manual and MPI-Maintenance Repainting Manual"Approved Product" listing.

.1 Use MPI listed materials having E2 orE3 rating where indoor air quality requirements exist.

.2 Primer: VOC limit 100 g/L maximum to GS-11 SCAQMD Rule 1113.

.3 Paint: VOC limit 100 g/L maximum to GS-11 SCAQMD Rule 1113.

.4 Colours:

.1 Submit proposed Colour Schedule to DCC Representative for review.

.2 Base colour schedule on selection of 5 base colours and 3 accent colours.

.5 Mixing and tinting:

.1 Perform colour tinting operations prior to delivery of paint to site, in accordance with manufacturer's written recommendations. Obtain written approval from DCC Representative for tinting of painting materials.

.2 Use and add thinner in accordance with paint manufacturer's recommendations.

.1 Do not use kerosene or similar organic solvents to thin water-based paints.

.3 Thin paint for spraying in accordance with paint manufacturer's written recommendations.

.4 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.

.6 Gloss/sheen ratings:

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

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

.2 Gloss level ratings of painted surfaces as indicated.

.7 Interior painting:

.1 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal.

.1 INT 5.1RR- High performance Architectural Latex (over anti-corrosive metal primer), G5 finish.

.2 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).

.1 INT 5.3M High Performance Architectural Latex (over water-borne galvanized primer), G5 finish.

.3 Galvanized metal: low traffic (pipes, overhead decking, and ducts, ect.)

.1 INT 5.3H - Waterborne Dry Fall Finish.

.4 Dressed Lumber: doors, door and window frames, casings, mouldings, etc.:(reserved)

.1 INT 6.3E-Polyurethane varnish, G4 finish (over stain).

.5 Electrical and telecom backboards:

.1 INT 6.4S – High Performance Architectural Latex, G5 finish.

.6 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock" type material, etc.

.1 INT 9.2B- Architectural Latex finish (over latex sealer).

.1 Typical Walls: G3 finish.

.2 Typical Ceilings: G2 finish.

.3 Wet and Service Areas: G5 finish.

.7 Bituminous coated surfaces: cast iron pipe, concrete, etc.:

.1 INT 10.2A - Latex, G5 finish.

Part 3 EXECUTION

3.1 GENERAL

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

.2 Perform preparation and operations for interior painting in accordance with MPI-Architectural Painting Specifications Manual except where specified otherwise.

3.2 EXAMINATION

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to DCC Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with 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 Maximum moisture content as follows:

.1 Stucco, plaster and gypsum board: 12%.

.2 Wood: 15%.

3.3 PREPARATION

.1 Protection of in-place conditions:

.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 DCC Representative

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.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 approval of DCC Representative.

.4 Clean and prepare surfaces in accordance with MPI-Architectural Painting Specification Manual specific requirements and coating manufacturer's recommendations.

.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.

.2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a 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 Minimize use of mineral spirits or organic solvents to clean up water based paints.

.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 pretreatment as soon as possible after cleaning and before deterioration occurs.

.6 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.

.1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas

.2 Apply wood filler to nail holes and cracks.

.3 Tint filler to match stains for stained woodwork.

.7 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.

.8 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

1. Galvanized steel at wet areas: to SSPC-SP7 – sweep blast.
2. Unpassivated zinc-coated metal: apply cold phosphate surface treatment to SSPC-PT2.
3. Passivated zinc-coated metal (white rusted): power wire brush to scuff galvanizing thoroughly, and solvent clean to SSPC-SP1.

.9 Touch up of shop primers with primer as specified.

.10 Do not apply paint until prepared surfaces have been accepted by DCC Representative.

3.4 APPLICATION

.1 Paint only after prepared surfaces have been accepted by DCC Representative

.2 Use method of application approved by DCC Representative.

.1 Conform to manufacturer's application recommendations.

.3 Apply coats of paint in continuous film of uniform thickness.

.1 Repaint thin spots or bare areas before next coat of paint is applied.

.4 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.5 Sand and dust between coats to remove visible defects.

.6 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.

.7 (reserved)

.8 Finish closets and alcoves as specified for adjoining rooms.

.9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

.10 Mechanical/Electrical Equipment:

.1 Paint conduits, piping, hangers, ductwork and other mechanical and electrical equipment exposed in finished areas, to match adjacent surfaces, except as indicated.

.2 Do not paint over nameplates.

.3 Keep sprinkler heads free of paint.

.4 Paint fire protection piping red.

.5 Paint disconnects switches for fire alarm system and exit light systems in red enamel.

.6 Paint natural gas piping yellow.

.7 Paint both sides and edges of backboards for telephone and electrical equipment before installation.

.1 Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

3.5 FIELD QUALITY CONTROL

.1 Interior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.2 Interior surfaces requiring painting shall be inspected by Paint Inspection Agency who shall notify DCC Representative and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

.3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to DCC Representative.

.4 Field inspection of painting operations to be carried out by independent inspection firm as approved by DCC Representative.

.5 Advise DCC Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coats have been approved.

.6 Cooperate with inspection firm and provide access to areas of work.

.7 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by DCC Representative.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning & Waste Management.

.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 & Waste Management.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning & Waste Management.

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

.4 Place paint and primer defined as hazardous or toxic waste, including tubes and containers, in containers or areas designated for hazardous waste.

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 DCC Representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by DCC Representative.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 09 91 23 - Interior Painting.

1.2 ACTION AND INFORMATIONAL 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 and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer licensed in Ontario, Canada.

.2 Indicate on drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

.4 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.4 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

.1 Operation and maintenance manual approved by, and final copies deposited with, DCC Representative before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.5 Approvals:

.1 Submit electronic copy of draft Operation and Maintenance Manual to DCC Representative for approval. Submission of individual data will not be accepted unless directed by DCC Representative.

.2 Make changes as required and re-submit as directed by DCC Representative.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 DCC Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. [Include changes to existing mechanical systems, control systems and low voltage control wiring].

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-Built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to DCC Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One glass for each gauge glass.

.3 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

.4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.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 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of DCC Representative.

.2 Inform DCC 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 DCC Representative.

3.2 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 23 - Interior Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.4 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Manufacturer's Field Services:

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

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

3.5 DEMONSTRATION

.1 DCC Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

.6 DCC Representative will record these demonstrations on video tape for future reference.

3.6 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 Waste Management: separate waste materials for reuse in accordance with Section 01 74 00 - Waste Management and Disposal.

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

3.7 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 78 00 - Closeout Submittals

1.2 REFERENCES

.1 Health Canada/Workplace hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS)

.2 National Fire Protection Association (NFPA)
- .1 NFPA 1--2006, Standard for Portable Fire Extinguishers

.3 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S508-M90 (R1995), Rating and Fire Testing of Fire Extinguishers and Class "D" Extinguishing Media

1.3 ACTION AND INFORMATION SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's printed product literature and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Provide shop drawings indicating the size, type and installation method of each type of extinguisher.

.4 Quality Control Submittals:
- .1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.5 Closeout Submittals:
- .1 Provide operation and maintenance data for incorporation into manual specified in Section -01 33 00 Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

PART 2 PRODUCTS

2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS

.1 Cartridge operated type or Stored pressure rechargeable type with hose and shut-off nozzle, ULC labelled for A, B and C class protection
  .1 Size: 2.2 kg

2.2 CABINETS

.1 Surface-Mounted:

  .1 Rectangular break-glass type enclosures sized accommodating extinguishers housed.

  .2 Constructed of No. 18 gauge corrosion-resistant steel with baked enamel finish.

  .3 Front glass panel, break-glass mechanism, and keyed alike cylinder locks.

.2 Recessed:

  .1 Rectangular cabinets sized to accommodate extinguishers housed.

  .2 Constructed of No. 18 gauge corrosion-resistant enamelled painted steel tub.

  .3 No. 14 gauge cleaned, and prime coat painted steel door and adjustable trim assembly with rounded corners, semi-concealed piano hinge.

  .4 Safety glass panel, and flush stainless-steel door latch.

  .5 Review final finishes with DCC representative.

.3 Each cabinet equipped with identification labelling, warning signage and instruction labelling.

2.3 IDENTIFICATION

.1 Identify extinguishers in accordance with recommendations of ANSI/NFPA 10-1998 CAN/ULC-S508-2002

.2 Attach bilingual tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install or mount extinguishers in cabinets in accordance with NFPA 10 at a maximum height of 1200mm A.F.F to the top of the cabinet so top of cabinet is at the top of the even block course.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 National Fire Protection Association (NFPA)
- .1 NFPA 14-13, Standard for the Installation of Standpipe and Hose Systems.

.2 National Building Code of Canada.

.3 Canadian Forces Fire Marshall Directive FMD4003.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Provide manufacturer's printed product literature and data sheets, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer licensed in Province of Ontario, Canada.
- .2 Submit complete plans to Authority of Jurisdiction for review and approval before commencement of work.
- .3 Indicate grooved joint couplings and fittings on drawings.

.4 Test reports:
- .1 Submit certified test reports for standpipe and hose assembly from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.5 Manufacturers' Instructions:
- .1 Provide manufacturer's installation instructions.

.6 Field Quality Control Submittals:
- .1 Manufacturer's Field Reports: manufacturer's field reports specified.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for standpipe and hose system for incorporation into manual specified in Section 01 78 00.

1.4 QUALITY ASSURANCE

.1 Qualifications:
- .1 Installer: company or person specializing in standpipe and hose assembly.

.2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Protection:
- .1 Store materials in dry location.
- .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Design system to NFPA 14 and following parameters:

.2 Combined with sprinkler systems: hydraulic.

2.2 PIPE, FITTINGS AND VALVES

.1 Ferrous Piping and Fittings:
- .1 Schedule 40 mild black carbon steel.
- .2 In accordance with ASTM A53/A53M, Grade B.

.2 Fittings and joints to NFPA 14:
- .1 Screwed:
  - .1 Class 125 cast iron screwed fittings.
  - .2 In accordance with ASME B16.4.
- .2 Welded:
  - .1 Factory made seamless carbon steel butt welding fittings.
  - .2 In accordance with ASTM A234/A234M, Grade WPB.
  - .3 Long sweep pattern wherever possible.

- .3 Grooved Mechanical Couplings:
  - .1 Rigid: Applications not allowing for movement.
  - .2 Flexible: Applications for controlled linear and angular movement.
  - .3 In accordance with ASTM A536, Grade 65-45-12.
  - .4 Joints designed with two ductile iron housing segments and pressure responsive EPDM synthetic rubber gasket.
  - .5 Zinc-electroplated steel oval neck track bolts and hex nuts in accordance with ASTM A449.
  - .6 Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
  - .7 Housing: Enamel finished.

.3 Valves:

.1 ULC listed for fire protection service.
.2 Up to NPS 2: bronze, screwed ends, grooved, OS&Y gate.
.3 NPS 2 1/2 and over: cast or ductile iron, roll grooved ends, indicating butterfly valve.
.4 Check valves: spring actuated swing type, composition disc or seal.

.4 Pipe hangers:
.1 ULC listed for fire protection services.

.5 Drain valve: NPS 1, complete with hose end, cap and chain.

.6 Inspector's test connections: NPS 1 gate valve.

2.3 CABINETS

.1 To NFPA 14 and ULC listed: flush, mounted type, constructed of 1.2 mm thick steel, 180 degrees opening door of 2.5 mm thick steel with hinge same side as water supply and latching device. Baked enamel paint finish.

.2 Cabinets to maintain fire resistive rating of construction in which they occur.

.3 Cabinet door: with 5 mm full glass panel.

.4 Large enough to accommodate angle valve. Approximate dimensions 350x350x200.

2.4 FIRE DEPARTMENT VALVE

.1 ULC listed, NPS 2 1/2 forged or cast brass angle valve: Chrome plated finish with thread compatible with local fire department, complete with handwheel, cap and chain. Cap to be part of ULC listing for valve.

2.5 PUMPER CONNECTION

.1 To NFPA 14, ULC listed, Siamese type, location as indicated. Threads to be compatible with local fire department complete with threaded metal caps and chains.

.2 Polished chrome plated surface mounted with identifying sign cast on plate.

2.6 PRESSURE GAUGES

.1 90 mm diameter.

2.7 FINISHES

.1 In finished areas, chrome plate valves, nozzles, fittings and hose rack and spanner.

.2 Cabinets.

.1 Tub: prime coated.
.2 Door and frame: No. 4 satin finish stainless steel.

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 datasheet.

3.2 INSTALLATION

.1 Install and test to acceptance in accordance with NFPA 14.

.2 Run inspectors test connections to sight glass.

.3 Install drain pipes and valves to drain parts of systems and so arranged that any one standpipe riser can be drained without shutting down any other parts of systems.

.4 Install 90 mm diameter pressure gauge in accordance with Section 23 05 19.01 at top of risers and in accordance with NFPA 14.

.5 The source of the water supply shall be reliable and capable of providing the required supply for not less than 30 minutes.

.6 Water supply for standpipe system:
.1 Class II Systems:
.1 Receive water supply sufficient to provide minimum of 378.50 lpm.
.2 System: capable of maintaining residual pressure of 414 kPa at topmost outlet with 378.50 lpm flowing.
.2 Water Supply for Combined Standpipe and Sprinkler Risers:
.1 Standpipe piping may not be used to supply water for automatic fire sprinkler systems.
.2 Standpipe systems: hydraulically designed.

3.3 SITE TEST

.1 General:
.1 In accordance with NFPA 14, supplemented as specified.
.2 In accordance with Section 01 91 13: General Requirements, supplemented as specified.

.2 Testing witnessed by DCC representative.

.3 Disposal of water used in flushing and testing:
.1 Discuss appropriate measures with Departmental Representative.

.4 Timing:
.1 Connect fire hoses when flushing out and pressure tests have been completed.
.2 Charge system with water when there is no possibility of freeze-up.
.3 Perform tests after pressure booster pumps have been tested.

.5 Co-ordination:
.1 Co-ordinate tests with performance verification of:

.1 Standpipe and hose systems specified Section.
.2 Fire alarm systems.
.3 Wet and Dry pipe sprinkler systems.

.6 Procedures:
.1 Verify that system is complete prior to start-up and testing procedures.
.2 Verify that ULC labels are visible.
.3 Fill system with water for pressure. Record water supply pressure.
.4 Pressure test piping system as required by authority having jurisdiction.
.5 Start up fire pumps and jockey pumps.
.6 Verify flow switches are operational.
.7 Verify valves in system are visible and monitored.
.8 Flushing: fill with water, let stand at operating pressure for 1 week. Drain risers separately, then drain main.
.9 Flush buried mains and lead-in connections before making connection to indoor sprinkler system.
.10 Perform flow tests, including tests of pre-action systems, as required by:
.1 Authority having jurisdiction.
.2 Applicable NFPA standards such as 13, 14, 20, 1273.
.3 Local building codes.
.11 Record incoming pressure to building for 10 days prior to activating system.
.12 Fill glycol legs, confirming proper operation of backflow preventers.
.13 Adjust pressure switches.
.14 Sundry checks:
.15 Verify that properly sized pressure restricting discs are installed where required.

.7 Identification:
.1 Verify devices are properly labelled, identifying area served, etc.
.2 Paint and identify all piping per 21 13 13 and FMD 4003 requirements.

.8 Report:
.1 Refer to Section 01 91 13, reports supplemented as specified.
.2 In addition to reports required by NFPA 14, include the following:
.1 Copy of schematic and valve schedule.

.9 Posted Instructions:
.1 Prepare schematic, mount behind glare-free glass and install where directed.
.2 Prepare valve schedule, mount behind glare-free glass and install where directed.

.10 Training:
.1 Refer to Section 01 91 13: Training of O&M Personnel.

.11 Documentation:
.1 Provide written certification to Departmental Representative that system was installed, flushed and tested in accordance with appropriate codes, approved plans and calculations.
.2 Certificate to include:
.1 Contractors name.
.2 Contractors address.
.3 Contractors license number.

.4 List of approved materials and devices installed.
.5 Description of system test conducted.
.6 Dates of flushing and testing.
.7 Certification that connections conform to acceptable standards.
.8 Certification that system is complete and in service.
.9 Approved signage has been provided and attached as appropriate.
.10 Hose threads of system and test connections match those of responding fire department.

3.4 CLEANING

.1 Clean in accordance with Section 01 74 00.
.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 National Fire Prevention Association (NFPA)
- .1 NFPA 13-2010, Standard for the Installation of Sprinkler Systems.
- .2 NFPA 20-2010, Standard for the Installation of Stationary Pumps for Fire Protection.
- .3 NFPA 24-2010, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
- .4 NFPA 25-2008, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

.2 Underwriter's Laboratories of Canada (ULC)
- .1 CAN/ULC-S543-09, Standard for Internal Lug Quick Connect Coupling for Fire Hose.
- .2 CAN/ULC-S543-09-AM1, Amendment 1 to Standard for Internal Lug Quick Connect Coupling for Fire Hose.

.3 National Building Code of Canada.

.4 Canadian Forces Fire Marshall Directive FMD 4003.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Provide manufacturer's printed product literature and data sheets, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer licensed in Province of Ontario, Canada.
- .2 Indicate:
  - .1 Materials.
  - .2 Finishes.
  - .3 Method of anchorage
  - .4 Number of anchors.
  - .5 Supports.
  - .6 Reinforcement.
  - .7 Assembly details.
  - .8 Accessories.

.4 Certificates:
- .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Manufacturers' Instructions:
- .1 Provide anufacturer's installation instructions.

.6 Field Quality Control Submittals:
.1 Manufacturer's Field Reports: manufacturer's field reports specified.

1.3 CLOSEOUT SUBMITTALS

.1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 78 00 in accordance with NFPA 20.

.2 Manufacturer's Catalog Data, including specific model, type, and size for:
.1 Pipe and fittings.
.2 Alarm valves.
.3 Valves, including gate, check, and globe.
.4 Water motor alarms.
.5 Sprinkler heads.
.6 Pipe hangers and supports.
.7 Pressure or flow switch.
.8 Fire department connections.
.9 Excess pressure pump.
.10 Mechanical couplings.

.3 Drawings:
.1 Sprinkler heads and piping system layout.
.1 Prepare 760 mm by 1050 mm detail working drawings of system layout in accordance with NFPA 13, "Working Drawings (Plans)".
.2 Show data essential for proper installation of each system.
.3 Show details, plan view, elevations, and sections of systems supply and piping.
.4 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.
.2 Electrical wiring diagrams.

.4 Design Data:
.1 Calculations of sprinkler system design.

.5 Field Test Reports:
.1 Preliminary tests on piping system.

.6 Records:
.1 As-built drawings of each system.
.1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.

.7 Operation and Maintenance Manuals:
.1 Provide detailed hydraulic calculations including summary sheet, and Contractors Material and Test Certificate for aboveground and underground piping and other documentation for incorporation into manual in accordance with NFPA 13.

.8 Dissinfection:
.1 Provide disinfection lab certificate.

1.4 QUALITY ASSURANCE

.1 Qualifications:
  .1 Installer: company or person specializing in wet sprinkler systems with documented experience.

.2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

.3 Obtain at least two consecutive satisfactory bacteriological samples from piping, analyzed by certified laboratory, and submit results to DCC representative prior to piping being placed into service.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:

.2 Provide maintenance materials in accordance with Section 01 78 00.

.3 Provide spare sprinklers heads (3 of each type) and tools in accordance with NFPA 13.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Protection:
  .1 Store materials in dry location.
  .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13 and National Building Code, by hydraulic calculations for uniform distribution of water over design area.

.2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.

.3 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.

.4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.

.5 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.

.6 Location of Sprinkler Heads:
- .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13 for ordinary hazard occupancy.
- .2 Uniformly space sprinklers on branch.

.7 Water Distribution:
- .1 Make distribution uniform throughout the area in which sprinkler heads will open.
- .2 Discharge from individual heads in hydraulically most remote area to be 100% of specified density.

.8 Density of Application of Water:
- .1 Size pipe to provide specified density when system is discharging specified total maximum required flow.

.9 Sprinkler Discharge Area:
- .1 Area: hydraulically most remote area as defined in NFPA 13.

.10 Outside Hose Allowances:
- .1 Include allowance in hydraulic calculations of 946 lpm for inside and outside hose streams.

.11 Friction Losses:
- .1 Calculate losses in piping in accordance with Hazen-Williams formula with 'C' value of 120 for steel piping, 150 for copper tubing, and 140 for cement-lined ductile-iron piping.

.12 Water Supply:
- .1 Base hydraulic calculations on static pressure of 524 kPa with 3929 lpm available at residual pressure of 462 kPa at junction with water distribution piping system.

.13 Conduct flow and pressure test of water supply in vicinity of project to obtain criteria for bases of design. Adjust water test values to allow for peak period water usage and provide minimum 35kPa safety factor margin for hydraulic calculations. Preliminary information obtained from flow test performed on hydrants located along Valour Drive indicates the following available street water supply:
- .1 Static pressure: 524 kPa.
- .2 Flow of 3929 Lpm at a residual pressure of 462 kPa.
- .3 Contractor shall conduct flow tests at established hydraul ic calculation flow demands in order to determine available s treet water pressure at required sprinkler demands.

2.2 ABOVE GROUND PIPING SYSTEMS

.1 Provide fittings for changes in direction of piping and for connections.

.2 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.
- .1 Perform welding in shop; field welding will not be permitted.

.3 Conceal piping in areas with suspended ceiling and as indicated on drawings.

2.3 PIPE, FITTINGS AND VALVES

.1 Standards: In accordance with NFPA 13.

.2 Ferrous Piping and Fittings:

.1 Pipe:

.1 Schedule 40 mild black carbon steel.

.2 In accordance with CSA B137.3

.3 In accordance with ASTM A53/A53M, Grade B

.2 Fittings and Joints.

.1 Screwed:

.1 Class 125 cast iron screwed fittings.

.2 In accordance with ASME B16.4.

.2 Welded:

.1 Factory made seamless carbon steel butt welding fittings.

.2 In accordance with ASTM A234/A234M, Grade WPB.

.3 Long sweep pattern wherever possible.Copper tube: screwed, soldered, brazed,

.3 Grooved:

.1 Joints designed with two ductile iron housing segments and pressure responsive EPDM synthetic rubber gasket.

.2 Zinc-electroplated steel oval neck track bolts and hex nuts in accordance with ASTM A449.

.3 Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact..

.3 Valves:

.1 ULC listed for fire protection service.

.2 Up to NPS 2: bronze, screwed or grooved ends. Ball or butterfly valves.

.3 NPS 21/2 and over: cast iron, flanged or roll grooved ends, indicating butterfly valve.

.4 Swing Check valves: Dual disc, spring loaded, UL and FM listed for horizontal or vertical installation, supplied drilled, tapped and plugged downstream for drainage outlet.

.5 Ball Drip: Bronze body, female inlet connection FM approved.

.6 Alarm Test: Combination sight glass/orifice, bronze top works with 1.4" NPT for attachments.

.7 Acceptable Manufacturers: The following fitting and valve list are acceptable.

.1 Victaulic

.2 Reliable

.3 Gruvlok

.4 Nibco

.5 Central

.4 Pipe hangers:

.1 ULC listed for fire protection services in accordance with NFPA.

2.4 SPRINKLER HEADS

.1 General: to NFPA 13 and ULC listed for fire services.

.2 Temperature ratings.

.1 Ordinary temperature rated sprinklers shall be used in all general areas.

.2 High temperature classification sprinklers shall be used in high temperature zones in

accordance with NFPA.

.3 Intermediate classification sprinklers shall be used in intermediate temperature zones.

.3 Sprinklers in light and ordinary hazard occupancies shall be quick-response. Install in accordance with the listing requirements of the certification organization.

2.5 STANDARD UPRIGHT/PENDANT SPRINKLER

.1 Bronze finish vertical upright pendant standard sprinklers with frangible glass bulb

.2 All rooms with exposed concrete or metal deck ceilings.

.3 For head requiring guards, provide chrome pendant head in areas with finished ceiling c/w chrome escutcheon and guard.

.4 Provide two piece deep escutcheon as indicated.

2.6 RECESSED PENDENT SPRINKLER

.1 Chrome finish recessed pendent sprinkler with matching adjustable escutcheon and frangible glass bulb.

.2 Location: all rooms with gypsum board or T-bar finished ceilings.

.3 Provide white finished recessed pendent sprinkler with matching adjustable escutcheon where indicated on drawings.

2.7 RECESSED HORIZONTAL SIDEWALL SPRINKLER

.1 Chrome finish recessed side wall sprinkler with matching adjustable escutcheon and frangible glass bulb.

.2 Location: all rooms with finished walls.

2.8 ALARM CHECK VALVE

.1 Alarm check valve to NFPA 13 and ULC listed for fire service.

.2 Provide variable pressure type alarm valve complete with retarding chamber, alarm test valve, alarm shutoff valve, drain valve, pressure gages, accessories, and appurtenances for proper operation of system.

.3 Provide valve complete with internal components that are replaceable without removing the valve from the installed position.

2.9 WATER MOTOR ALARMS

.1 Provide alarms approved weatherproof and guarded type, to sound locally on flow of water in each corresponding sprinkler system.

.2 Provide separate drain piping directly to exterior of building.

2.10 SUPERVISORY SWITCHES

.1 General: to NFPA 13 and ULC listed for fire service.

.2 Valves:

.1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.

.3 Pressure or flow switch type:

.1 With normally open and normally closed contacts and supervisory capability.

.2 Provide switch with circuit opener or closer for automatic transmittal of alarm over facility fire alarm system.

.3 Connect into building fire alarm system.

.4 Connection of switch

.1 Coordinate with work of Division 28 fire alarms system vendor.

.2 Alarm actuating device: mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and instantly recycle.

.5 Pressure alarm switch:

.1 With normally open and normally closed contacts and supervisory capability.

2.11 WATER GONG

.1 To NFPA 13 and ULC listed for fire service. Location as indicated.

2.12 FIRE DEPARTMENT CONNECTION

.1 Provide connections approximately 1.0 m above finish grade, location as indicated.

.2 To NFPA 13 and CAN/ULC-S543 listed, Siamese type.

.3 Polished chrome plated of approved two-way type with 2.5 inch National Standard female hose threads with plug, chain, and identifying fire department connection escutcheon plate.

.4 Thread specifications: compatible with local fire department.

.5 Install a 90-degree elbow with drain connection at the low-point near each fire department connection to allow for system drainage to prevent freezing.

2.13 EXCESS PRESSURE PUMP

.1 Provide pumps on sprinkler piping riser as indicated.

.2 Pumps:

.1 Pumps: positive displacement, gear type rated at 1 lpm, integrally mounted with motor.

.2 Double acting displacement type, open cylinder design, direct drive, ULC listed, complete with relief valve.

.3 Pump and motor unit:

.1 Approved for automatic wet pipe fire extinguishing sprinkler systems; complete with pilot light panel, differential motor control switch, high pressure switch, and low pressure switch.

.2 EEMAC Class B squirrel cage induction 1725 rpm, continuous duty, drip proof, ball bearing, maximum temperature rise 50 degrees C, 0.25 kW, 120/1/60.

.3 Capacity: 7.6 L/min.

.4 Provide electrical power supply connections for pump and pilot light panel at supply side of building service panel.

.5 Provide separate fused safety-type switch with locked lever for each connection.

.6 Provide pressure pump sensing piping in supply piping upstream of fire pump.

.7 Pump operation switch: to operate excess pressure pump with pressure differential of 103 kPa.

.8 Shut-off valve and strainer on pump inlet. Relief valve, check valve and shut-off valve on discharge connections.

2.14 PRESSURE GAUGES

.1 ULC listed and to Section 23 05 19.01.

.2 Maximum limit of not less than twice normal working pressure at point where installed.

2.15 PIPE SLEEVES

.1 Provide pipe sleeves where piping passes through walls, and roofs.

.2 Secure sleeves in position and location during construction.

.3 Provide sleeves of sufficient length to pass through entire thickness ofwalls, floors, and roofs.

.4 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.

.1 Firmly pack space with mineral wool insulation.

.2 Seal space at both ends of sleeve or core-drilled hole withplastic waterproof cement which will dry to firm but pliable mass, provide mechanically adjustable segmented elastomeric seal for extra wall penetrations below grade.

.3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.

.5 Sleeves in Masonry and Concrete Walls, Floors, and Roofs:

.1 Provide hot-dip galvanized steel, ductile-iron, cast-iron sleeves.

.2 Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in core-drilled hole are completely grouted smooth.

.6 Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs:

.1 Provide 0.61 mm thick galvanized steel sheet.

2.16 ESCUTCHEON PLATES

.1 Provide split hinge type metal plates for piping passing through walls, floors, and ceilings in exposed spaces.

.2 Provide paint finish on metal plates in unfinished spaces.

2.17 CABINETS

.1 To NFPA 14 and ULC listed: flush, mounted type, constructed of 1.2 mm thick steel, 180 degrees opening door of 2.5 mm thick steel with hinge same side as water supply and latching device. Baked enamel paint finish.

.2 Cabinets to maintain fire resistive rating of construction in which they occur.

.3 Large enough to accommodate all zone control items as shown on drawings.

2.18 INSPECTOR'S TEST CONNECTION

.1 Locate inspector's test connection at hydraulically most remote part of each system, provide test connections approximately 3 m above floor for each sprinkler system or portion of each sprinkler system equipped with alarm device.

.2 Provide test connection piping to location where discharge will be readily visible and where water may be discharged without property damage.

.3 Provide discharge orifice of same size as corresponding sprinkler orifice.

2.19 SIGNS

.1 Attach properly lettered Bilingual and approved metal signs to each valve and alarm device to NFPA 13.

.2 Permanently fix hydraulic design data nameplates to riser of each system.

2.20 SPARE PARTS CABINET

.1 Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each alarm valve. Number and types of extra sprinkler heads as specified in NFPA 13.

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 datasheet.

3.2 INSTALLATION

.1 Install, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.

3.3 PIPE INSTALLATION

.1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.

.2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.

.3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.

.4 Inspect piping before placing into position.

3.4 ELECTRICAL CONNECTIONS

.1 Provide electrical work associated with this section under Section 26 05 00.

.2 Provide fire alarm system under Section 28 46 00.

.3 Provide control and fire alarm wiring, including connections to fire alarm systems, in accordance with National Electrical Code.

.4 Provide wiring in rigid metal conduit or intermediate metal conduit under section 28 46 00.

3.5 DISINFECTION

.1 Disinfect new piping.

.2 Fill piping systems with solution containing minimum of 50 parts per million of chlorine and allow solution to stand for minimum of 24 hours.

.3 Flush solution from systems with clean water until maximum residual chlorine content is not greater than 0.2 part per million or residual chlorine content of domestic water supply.

.4 Obtain at least two consecutive satisfactory bacteriological samples from piping, analyzed by certified laboratory, and submit results to DCC representative prior to piping being placed into service.

3.6 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS

.1 Notify DCC representative in writing at least 15 working days prior to connection date.

.2 Use or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure.

.3 Bolt sleeves around main piping.

.4 Bolt valve to branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service.

.5 Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labour as required.

3.7 BURIED PIPING SYSTEM

.1 Bury tape with printed side up at depth of 30 cm below the top surface of earth or top surface of subgrade under pavements.

3.8 FIELD PAINTING

.1 Clean, pretreat, prime, and paint new systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories.

.2 Apply coatings to clean, dry surfaces, using clean brushes.

.3 Clean surfaces to remove dust, dirt, rust, and loose mill scale.

.4 Immediately after cleaning, provide metal surfaces with 1 coat of pretreatment primer applied to minimum dry film thickness of 0.3 ml, and one coat of zinc chromate primer applied to minimum dry film thickness of 1.0 ml.

.5 Shield sprinkler heads with protective covering while painting is in progress.

.6 Upon completion of painting, remove protective covering from sprinkler heads.

.7 Remove sprinkler heads which have been painted and replace with new sprinkler heads.

.8 Provide primed surfaces with following:

- .1 Piping in Finished Areas:
- .2 Provide primed surfaces with 2 coats of paint to match adjacent surfaces. Final colour selection by DCC representative.
- .3 Provide valves and operating accessories with 1 coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil.
- .4 Provide piping with 50 mm wide red enamel bands self-adhering red plastic bands spaced at maximum of 6 m intervals throughout piping systems.
- .5 Piping in Unfinished Areas:
- .6 Provide primed surfaces with one coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.
- .7 Provide piping with 50 mm wide red enamel bands self-adhering red plastic bands spaced at maximum of 6 m intervals.

3.9 FIELD QUALITY CONTROL

.1 Site Test, Inspection:

.2 Perform test to determine compliance with specified requirements in presence of DCC Representative.

.3 Test, inspect, and approve piping before covering or concealing.

.4 Preliminary Tests:

.1 Hydrostatically test each system for a 2 hour period with no leakage or reduction in pressure.

.2 Flush piping with potable water in accordance with NFPA 13.

.3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.

.4 Test alarms and other devices.

.5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.

.5 Formal Tests and Inspections:

.1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved by DCC representative.

.2 Submit written request for formal inspection at least 15 days prior to inspection date.

.3 Repeat required tests as directed.

.4 Correct defects and make additional tests until systems comply with contract requirements.

.5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.

.6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.

3.10 CLEANING

.1 Clean in accordance with Section 01 74 00.

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

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 National Fire Protection Association (NFPA)
- .1 NFPA 13-2010, Standard for the Installation of Sprinkler Systems.
- .2 NFPA 25-2008, Water-Based Fire Protection Systems Handbook.

.2 Underwriter's Laboratories of Canada (ULC)
- .1 CAN/ULC-S543-09, Standard for Internal Lug Quick Connect Coupling for Fire Hose.
- .2 CAN/ULC-S543-09-AM1, Amendment 1 to Standard for Internal Lug Quick Connect Coupling for Fire Hose.
- .3 Canadian Forces Fire Marshall Directive FMD 4003

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Provide manufacturer's printed product literature and data sheets for equipment and systems, applicable series designation or style and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer licensed in Province of Ontario, Canada.

.4 Manufacturers' Instructions:
- .1 Instructions: provide manufacturer's installation instructions.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

.2 Provide detailed hydraulic calculations including: summary sheet, Contractor's Material and Test Certificate for aboveground and underground piping, as well as other deliverables for incorporation into manual specified in Section 01 78 00, in accordance with NFPA 13.

1.4 QUALITY ASSURANCE

.1 Qualifications:
- .1 Installer: company or person specializing in dry sprinkler systems with documented experience.
- .2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:
- .1 Provide maintenance materials in accordance with Section 01 78 00.
- .2 Provide spare sprinklers and tools in accordance with NFPA 13.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

PART 2 - PRODUCTS

2.1 ENGINEERING DESIGN CRITERIA

.1 Design system in accordance with NFPA 13, using following parameters:
- .1 Hazard:
  - .1 To suit occupancy as indicated.
  - .2 Pipe size and layout:
  - .3 Hydraulic design.
  - .4 Sprinkler head layout: to NFPA 13.
- .2 Water supply:
  - .1 Conduct flow and pressure test of water supply in vicinity of project to obtain criteria for bases of design in accordance with NFPA 13.

2.2 PIPE, FITTINGS AND VALVES

.1 Standards: In accordance with NFPA 13.

.2 Schedule 40 Galvanized Steel Pipe and Fittings:
- .1 Pipe:
  - .1 Schedule 40 galvanized steel hot, dipped in zinc providing corrosion resistant coating on walls of pipe.
  - .2 Grooved ends or threaded screwed ends.
  - .3 In accordance with ASTM A53/A53M, Grade B.

.2 Auxiliary valves:
- .1 ULC listed for fire protection service.
- .2 Up to NPS 2: bronze, screwed ends, grooved, OS & Y gate.
- .3 NPS 2 1/2 and over: cast or ductile iron, flanged or roll grooved ends, indicating butterfly valve.
- .4 Swing or spring-actuated check valves.
- .5 Ball drip.
- .6 Tamper devices wired back to fire alarm panel.

.3 Pipe hangers:

.1 ULC listed for fire protection services.

2.3 DRY SPRINKLERS

.1 Chrome finish dry sprinkler with centre strut, lever and solder capsule with valve mechanism at the inlet end of main tube.
- .1 Pendent with escutcheon
- .2 Recessed with cup and escutcheon assembly.
- .3 Concealed with sprinkler and cover plate assembly.

2.4 AUXILIARY SUPERVISORY SWITCHES

.1 General: to NFPA 13 and ULC listed for fire service.

.2 Valves:
- .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.

.3 Flow switch type:
- .1 With normally open and normally closed contacts and supervisory capability.

.4 Pressure alarm switch:
- .1 With normally open and normally closed contacts and supervisory capability.

2.5 DRY PIPE VALVE

.1 ULC listed.

.2 Cast or ductile iron, flanged or grooved end type, sized to suit water main.

.3 Components:
- .1 Accelerator.
- .2 Air maintenance device with low pressure alarm.
- .3 Alarm pressure switch with supervisory capability.
- .4 Pressure gauges.
- .5 Drain valve.
- .6 Test valve with associated piping.
- .7 Shut off valve - OS & Y with tamper-proof device wired back to fire alarm panel.
- .8 Required air pressure 90 kPa (13 psi).

.4 Provide valve complete with internal components that are replaceable without removing valve from installed position.

2.6 SINGLE INTERLOCK PRE-ACTION SYSTEM

.1 General:

.2 Provide an integrated fire protection system, single interlock, electric-release pre-action type system, as indicated, including:

.1 Pre-action valve and trim
.2 Release panel and addressable control module.

.3 All system components shall be "compatible" and UL, cUL (ULC) listed or FM approved. Note: The word compatible used in this specification means that the items concerned have been tested and listed and/or approved for their use together.

.2 System Design:
.1 The system must be designed for:
.1 Occupancy hazard: as indicated on drawings.

.3 Drawings & Hydraulic Calculations:
.1 The contractor must prepare and submit for DCC Representative approval all installation drawings & hydraulic calculations, as required by NFPA-13.

.4 Pre-action skid package:
.1 Supply and install a pre-action skid package containing all hydraulic and electrical components required for the control of a pre-action system. System shall include the following:
.1 Sturdy 14 gauge steel skid measuring approximately 38" x 24 x 6 1/2" high (969 x 603 x 1737 mm high) per zone.
.2 Rust proof coating, inside and outside, fire read, oven baked polyester powder on phosphate base.
.3 Deluge Valve complete with supervised butterfly valve releasing from
.4 Control panel, with emergency batteries.
.5 Automatic air compressor of sufficient capacity to fill the system in prescribed time (1/2 HP- 120V-1Ø).
.6 Electrical junction boxes for connection of detection system, auxiliary contacts and air compressor.
.7 Gauges to indicate water supply pressure, priming water pressure and air pressure of the system.
.8 Each actuation and supervisory device required.
.9 Schedule 40 galvanized steel pipe header to be connected to the drain. Open drain cups in the cabinet will not be accepted.
.2 All assembly components must be "compatible" and be UL, cUL (ULC) listed for this use.
.3 The assembly must be pre-assembled, pre-wired and tested, as integrated system.

.5 Detection & Signaling System:
.1 Supplied & installed by Div.26.
.2 Provide addressable control module to allow new fire alarms detectors to initiate signal & sequence.

.6 System Operation: Provider listed releasing control panel to perform the following sequence of operation:

.1 Both the activation of the detection condition and the opening of an automatic sprinkler are necessary to cause the water sprinkler are necessary to cause the water discharge. (Single zone detection condition).

.2 The activation alone of an electrical warning device and the activation of an alarm contact for remote transmission but will cause the system to fill.

.3 The opening of an automatic sprinkler or damage to system piping without electrical detection will initiate the sounding of a warning device and the activation of an alarm contact but will not cause the system to fill.

.4 The activation of at least one electrical detector on either detection zones (single zones) and the opening of an automatic sprinkler will cause water to discharge. The alarm signal will sound and an auxiliary contact for a water flow signal will be activated.

.7 Nitrogen Generation System

.1 Provide a nitrogen generator system to service all dry zones as required by the system size and pressure requirement determined by hydraulic calculations. Install per manufacturers instructions.

.2 The nitrogen generator shall have an air compressor system that is sized appropriately for the application and capable of achieving system supervisory pressure within 30 minutes in accordance with requirements of NFPA 13. The air compressor system may include an external compressor.

.3 The Nitrogen generator shall provide a minimum of 98% purity nitrogen to the fire sprinkler system.

.4 The nitrogen generator shall be equipped with a filtration system to remove residual water and all hydrocarbons from the air stream.

.5 The nitrogen generator shall have a nitrogen control panel capable of monitoring compressor run times, generator pressure, as well as its operational mode locally via the internet.

.6 The nitrogen generator shall have a leak detection system capable of determining sprinkler system leak rates, giving alerts if leaks develop within the sprinkler piping, nitrogen generator system or the air compressor.

.7 The nitrogen generator shall be able to indicate trouble alerts: locally via the nitrogen control panel, via BMS trouble alert relay via internet and via email.

.8 The nitrogen generator system shall automatically switch between air bypass mode and nitrogen generating mode based on demands of the sprinkler system.

.9 The nitrogen generator shall have a nitrogen storage tank that conforms to the ASME standard for pressure vessels.

.8 Air Maintenance device

.1 Provide an air maintenance device for each dry sprinkler system.

.2 The air maintenance device shall be equipped with an adjustable pressure regulator that is capable of setting the required pressure for the fire sprinkler system.

.3 The air maintenance device shall be listed or approved by the fire sprinkler application.

.4 The air maintenance device shall be installed per manufacturers specifications.

.9 Nitrogen self purge

.1 Provide the NGP-SPV off a tee connection at the end of the sprinkler system as per the manufacturers recommendations.

.10 System Drain:

.11 The drain collector of the integrated system shall be connected to an open drain. The drain piping shall not be restricted or reduced and of the same diameter as the drain collector.

2.7 ALARM CHECK VALVE ASSEMBLY

.1 Provide a listed alarm check valve system installed in accordance with ANSI/NFPA, c/w check valve, cut groove inlet & outlet, drain, alarm line strainer, pressure switch, two (2) water gauges, water motor alarm, wet pipe alarm valve, main drain valve, alarm test valve, excess pressure pump (1/3 HP - 120V 1 Ø) and main drain.

.2 Acceptable material: Victaulic, Viking, Grinnell.

2.8 FIRE DEPARTMENT CONNECTION

.1 Fully recessed type, 100 mm Ø x 65 Ø x 65 Ø with "STANDPIPE and SPRINKLER", "SPRINKLER" or "STANDPIPE" identification, polished chrome finish.

.2 Reference drawing 1/404 for exact identification.

2.9 SIGNS

.1 Signs for control drain and test valves: to NFPA 13.

2.10 COMPRESSED AIR SUPPLY

.1 Automatic Air Compressor.

.2 ULC listed.

.3 Capacity:

.1 To restore normal air pressure in system within 30 minutes.

.2 To provide air pressure of 140 kPa in excess of calculated trip pressure of dry pipe valve and in accordance with instruction sheet furnished with dry pipe valve.

.4 Piping: ferrous, NPS 3/4 screwed joints and fittings, to NFPA 13.

2.11 PRESSURE GAUGES

.1 ULC listed and to Section 23 05 19.01.

.2 Maximum limit of not less than twice normal working pressure at point where installed.

2.12 SPARE PARTS CABINET

.1 For storage of maintenance materials, spare sprinkler heads and special tools.

.2 Construct to sprinkler head manufacturers standard.

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 datasheet.

3.2 INSTALLATION

.1 Install, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.

.2 Testing to be witnessed by CFPO through DCC Representative.

.3 Install fire department connections as indicated.

.4 Provide nitrogen generator with air maintenance device and pressure control for dry pipe zone. Install as per manufacturers recommendations.

.5 Install spare parts cabinet as indicated.

.6 Pressure gauges:

.1 Location:

.1 On water side and air side of dry pipe valve.

.2 At air receiver.

.3 In each independent pipe from air supply to dry pipe valve.

.4 At exhausters and accelerators.

.2 Install to permit removal.

.3 Locate so as not subjected to freezing.

.7 Valve identification:

.1 Identify drain valve, by-pass valves and main shut-off valve and all auxiliary valves.

3.3 FIELD QUALITY CONTROL

.1 Site Test, Inspection:

.2 Perform test to determine compliance with specified requirements in presence of DCC Representative.

.3 Test, inspect, and approve piping before covering or concealing.

.4 Preliminary Tests:

.1 Hydrostatically test each system for a 2 hour period with no leakage or reduction in pressure.

.2 Flush piping with potable water in accordance with NFPA 13.

.3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.

.4 Test alarms and other devices.

.5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.

.5 Formal Tests and Inspections:

.1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved by DCC representative.

.2 Submit written request for formal inspection at least 15 days prior to inspection date.

.3 Repeat required tests as directed.

.4 Correct defects and make additional tests until systems comply with contract requirements.

.5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.

.6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.

3.4 CLEANING

.1 Clean in accordance with Section 01 74 00.

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

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)

- .1 ANSI/ASME B1.20.1-(R2018), Standard for Pipe Threads, General Purpose.
- .2 ANSI/ASME B16.3-2022, Malleable Iron Threaded Fittings Classes 150 and 300.
- .3 ANSI/ASME B16.9-2024, Factory Made Wrought Buttwelding Fittings.
- .4 ANSI/ASME 2004 Boiler and Pressure Vessel Code - Section IX, Welding and Brazing Qualifications.

.2 American Society of Mechanical Engineers (ASME)

- .1 ASME B31.1-2024, Power Piping.

.3 ASTM International (ASTM)

- .1 ASTM A53/A53M-18, Standard Specification for Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- .2 ASTM A106/A106M-19, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
- .3 ASTM A197/A197M-00(2019), Standard Specification for Cupola Malleable Iron.
- .4 ASTM A234/A234M-03, Standard Specification for Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

.5 National Fire Protection Association (NFPA)

- .1 NFPA 2001-2025, Standard on Clean Agent Fire Extinguishing Systems.
- .2 NFPA 70-2023, National Electrical Code.

.6 Underwriters' Laboratories Inc. (UL) - Fire Protection Equipment Directory-2002

- .1 UL 1058-2006, Standard for Halogenated Agent Extinguishing System Units.
- .2 UL 2166-2021, Standard for Halocarbon Clean Agent Extinguishing Systems Units.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit product data for the following:
    - .1 Storage cylinders.
    - .2 Control valves and pilot controls.
    - .3 Control panels.
    - .4 Nozzles.
    - .5 Push button stations.
    - .6 Detectors.
    - .7 Alarm bells or horns.
    - .8 Switches.

.9 Annunciators.

.2 Submit electronic copy WHMIS SDS - Safety Data Sheets in accordance with Section 02 81 00 - Hazardous Materials.

.3 Provide shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.1 Shop drawings: Submit drawings stamped and signed by professional engineer licensed in Ontario, Canada.

.1 Submit shop drawings indicating:

.1 Detailed layout of system.

.2 Component descriptions and locations.

.3 Control diagrams.

.4 Wiring diagrams.

.5 Written sequence of operations.

.2 Submit electrical schematics and piping diagrams describing complete suppression system.

.4 Submit test reports for the following:

.1 Room integrity test.

.2 Pressure test.

.3 Flow test.

.5 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.

.1 Nozzle.

.2 Signs and valve tags.

.7 Quality Control Submittals:

.1 Manufacturer’s Instructions: manufacturer’s installation instructions.

.2 Manufacturer’s Field Reports: manufacturer’s field reports in accordance with Section 01 33 00 - Submittal Procedures.

.8 Closeout Submittals:

.1 Electrical schematic of circuits.

.2 Written description of system design.

.3 Drawings illustrating control logic and equipment location.

.4 Written documentation for:

.1 Emergency procedures.

.2 Abort functions.

.3 System control panel operation.

.4 Trouble procedures.

.5 Safety requirements.

1.3 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Design system in accordance with NFPA 2001 using following parameters:

.1 Hazard: to suit occupancy as indicated.

.2 Submit design calculations for following:

.1 System terminal pressures.

.2 Nozzle flow rates.

.3 Orifice code number.

.4 Piping pressure losses.

.5 Component flow data.

.6 Pipe sizes.

.7 Minimum design concentration.

.8 Minimum design agent quantity.

.9 Actual agent quantity.

.10 Highest expected actual concentration.

.11 Discharge time.

.12 Concentration hold time.

.13 Enclosure pressure venting.

.3 Submit schematics and diagrams describing suppression system and interface with building system.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store materials protected from weather conditions and at temperature conditions recommended by manufacturer.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00 – Cleaning and Waste Management.

1.5 WARRANTY

.1 Warranty system for parts and labour for not less than a period of 12 months from date of installation.

.2 False Discharge Warranty: Warranty replacement and associated costs of clean agent in event of false discharge attributable to defects in installation or parts for period of 12 months from date of installation.

.3 Warranty capability to recondition complete system within 24 hours in event of system activation.

1.6 COMMISSIONING

.1 Upon acceptance, system shall be conditions and placed in operation.

1.7 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance data for system and components for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Provide spare parts as follows:

.1 2 nozzles.

.2 1 discharge valve.

.2 Maintenance Service:

.1 Provide regular maintenance service to system in accordance with clean agent manufacturer's written recommendations and maintenance manual for period of 12 months.

.2 Inspection personnel: authorized by clean agent manufacturer.

.3 Inspect system 6 months and 12 months after installation.

.4 Conduct inspections in accordance with manufacturer's guidelines and recommendations of NFPA 2001.

.5 Inspections include but are not necessarily limited to:

.1 Determination of clean agent contents and pressure.

.2 Proper working order of control, detection and alarm systems.

.6 Submit documents certifying satisfactory system conditions after inspections.

PART 2 PRODUCTS

2.1 SUPPRESSION AGENT

.1 Suppression Agent:

.1 NFPA Designation: HFC-227ea.

.2 Chemical Name: Heptafluoropropane.

2.2 AGENT STORAGE

.1 Capacity: 146 kg high pressure seamless steel alloy cylinder.

.2 Cylinder charging pressure: 3447 kPa at 21.1 degrees C.

.3 Quantity: 1 cylinder.

.4 Standard:

.1 Manufactured, tested and marked in accordance with DOT Specification 4BW500 or 4BA500.

.2 In accordance with suppression agent manufacturer.

.5 Cylinder Assembly:

.1 Pressure seat type valve equipped with gauge.

.2 Cylinder pressure supervisor switch to provide a signal at the control panel if the pressure in the cylinder drops to 2206 kPa.

.3 Protective cap: threaded steel anti-recoil.

.4 Installation: free standing steel racks.

.5 Lifting lugs: cylinders larger than 97 kg with lifting lugs.

.6 Brackets: integral brackets to be provided for secure mounting.

.7 Discharge Valve:

.1 Material: machined brass forging.

.2 Design: pressure seated, high flow rate design incorporating brass piston with seal, pressure releasing for valve operation, safety disc assembly, pressure actuation outlet port and pressure gauge.

2.3 RELEASING DEVICE

.1 Detection: to signal automatic release [and/or alarm] by [optical] [ionization] type smoke detectors and/or heat (rate compensated) detectors signalling control panel.

.2 Alarms:

.1 Quantity: 1.

.2 Type: horn/strobe.

.3 Locations:

.1 To alert personnel located in protected areas.

.2 At entrance to protected areas.

.3 Operation:

.1 Automatic release solenoid-operated valve on cylinder valve that causes discharge of agent storage containers in system.

.2 Program control panel to provide adequate pre-discharge alarm period at time of system test to ensure personnel safety.

.4 Supervision: each releasing device separately series supervised and activated by output directly from control panel.

.5 Features:

.1 Releasing device: removable from container valve without emptying container.

.2 While removed from container valve, releasing device capable of being operated, with no replacement of parts required after this operation.

2.4 MANUAL OVERRIDE

.1 Manual lever actuator for override applications.

2.5 CHECK VALVE

.1 Quantity1 for each cylinder connected to common manifold.

2.6 PRESSURE REDUCER

.1 Orifice plate:

.1 Stainless steel.

.2 Orifice size 12.5 or 25 mm NPT.

2.7 AUXILIARY SWITCHES

.1 General: to ANSI/NFPA 13 and ULC listed for fire service

.2 Quantity:

.1 1 normally open contacts.

.2 1 normally closed contacts.

.3 Type:

.1 Normally open and normally closed contacts with supervisory capability, pressure operated upon release of clean agent into discharge piping.

.2 Heavy duty, double pole, single throw, two to unit.

.3 Complete with manual operator for test and reset.

.4 Signal:

.1 Shut down of electric power to ventilation system.

.2 Alarm.

2.8 DISCHARGE NOZZLES

.1 Coverage: in accordance with NFPA 2001

.2 Dispersion pattern: 360 degrees.

.3 Material: corrosion resistant construction and specifically designed for specified clean agent application.

.4 Markings: permanently marked as to [type] [part number] and orifice size.

.5 Pipe thread: standard thread corresponding to nozzle size for attachment to discharge piping.

.6 Standards: UL listed

2.9 DISTRIBUTION PIPE AND FITTINGS

.1 Material: black steel in accordance with NFPA 2001

.2 Pipe wall thickness: to ASME B31.1

.3 Pipe junctions:

.1 50 mm and smaller: threaded.

.2 Greater than 50 mm: grooved.

.4 Piping design:

.1 To NFPA 2001

.2 Routing: layout piping to give maximum flow and to avoid possible mechanical, chemical or other damage.

.5 Pipe threads: to ANSI B1.20.1

.6 Pipe reductions: swaged nipples.

.7 Screwed pipe reductions: screwed concentric reducing fittings.

.8 Non-corrosive pipe: hot-dipped galvanized inside and out.

2.10 PIPE SLEEVES

.1 Sleeve piping through building walls, partitions, floor slabs, and roof slabs.

.2 Material: schedule 40 steel pipe at two sizes (minimum) greater than pipe being sleeved.

.3 Extend sleeves through floor slabs minimum 50 mm above floor.

.4 Extend sleeves through roof slabs to permit clearance for roofing and flashing material.

2.11 PIPE HANGERS AND SUPPORTS

.1 To ASME B31.1

.2 Hanger material: steel.

2.12 ACCESSORIES

.1 Cylinder weighing:

.1 Provide rack uprights with weigh bar spanning rack for support of portable weighing device.

.2 Provide portable direct reading beam scale for weighing cylinders in place by loosening cylinder clamps and disconnecting discharge heads without disconnecting control components.

.2 Cylinders: fit cylinders with capacity of 97 kg or more with liquid level indicating device.

.1 Provide graph to translate device reading to pounds of clean agent at cylinder temperature.

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 INSTALLERS

.1 System components and accessories installed by personnel trained ad certified by clean agent specified manufacturer.

.2 Install, inspect and test to acceptance in accordance with NFPA Standard 2001[NFPA 70] [_____].

3.3 INSTALLATION

.1 General: to NFPA Standard 2001

.2 In accordance with clean agent manufacturer's written instructions.

.3 Install cylinders with service aisle for cylinder removal and cylinder weighing.

3.4 PIPING

.1 Ream pipe after cutting to remove burrs and sharp edges.

.2 Clean pipe before installation to remove foreign matter and oil from pipe.

.1 Pull wire brush through pipe lengths several times.

.2 Follow with clean cloth rags treated with a non-combustible metal cleaner designed for purpose.

.3 Blow [dry air] [nitrogen] through piping prior to installation of nozzles.

.4 [Treat with protective coating] [galvanize] pipe and fittings installed outdoors or in corrosive atmospheric area.

.5 Install piping in accordance with layout design to provide maximum flow and to avoid possible mechanical, chemical or other damage.

.6 Report deviations from pipe routing design to DCC Representative.

.7 Pipe reductions: install reductions to permit full flow. Entrance holes from main pipe run to fitting to be of proper size and free of sharp edges, ridges or burrs.

.8 Valve and Equipment Connections:

.1 Connect [selector] [check] [solenoid] valves with union immediately downstream.

.2 Connect valves having more than two connection points such as [shuttle] [pilot] valves with union adjacent to valve in each connection line.

.3 Connect equipment such as [discharge delay devices] [pressure switches] with union adjacent to equipment.

.9 Pressure release piping and fittings: locate take-offs for pressure release piping from top of discharge piping.

3.5 PIPE HANGERS AND SUPPORTS

.1 Fasten piping near nozzles to prevent pipe movement due to reaction force during discharge.

.2 Install piping supports to prevent disengagement of supports by movement of supported pipe.

.3 Solidly anchor pipe to structural members where longitudinal or lateral movements is possible.

.4 Install rigid hangers wherever change in direction or change in elevation in piping system occurs.

.5 Every other hanger: rigid on long straight runs.

.6 Attach piping to rigid hangers by means of U-bolts locked with double nuts, one on each side of hanger.

.7 Allow for longitudinal movement of pipe within U-bolt except where piping design requires pipe to be anchored.

.8 Do not support pipe using other pipeline.

.9 Arrange piping supports to prevent bending stresses from concentrated loads between supports.

3.6 FIELD QUALITY CONTROL

.1 Site Tests:

.1 Test installation for correct operation and function.

.2 Provide requisite equipment, personnel, independent testing consultants to complete tests and

provide written reports of results.

.3 Room Integrity:

.1 Standard: to NFPA 2001

.2 Test room integrity in accordance with [testing consultant] [clean agent manufacturer's written instructions] using[door fan method] of room pressurization to determine leakage.

.3 Provide written test report to Departmental Representative of results.

.4 Correct deficiencies and retest.

.4 Pressure Test:

.1 Pneumatically test system discharge piping in closed circuit for period of ten minutes at 2750 kPa.

.2 Pressure drop not exceed 20% of test pressure.

.5 Flow Test:

.1 Perform flow test using nitrogen on the pipe network to verify that flow is continuous and that piping and nozzles are unobstructed.

.2 Install 'telltales' Styrofoam cups over each nozzle that will easily blow off when nitrogen pressure reaches nozzle.

.2 Manufacturer's Field Services:

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

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 00 – Cleaning and Waste Management.

3.8 DEMONSTRATION

.1 Upon completion of installation provide 'hand-on' site review of system components and operation.

.2 Functionally test system to demonstrate system components, system functions and recommended procedures for building maintenance personnel.

.3 Training to include but not necessarily limited to training for emergency procedures, abort functions, system control panel operation, trouble procedures and safety requirements.

.4 Duration of training: \2 shifts of 8 hours.

END OF SECTION

PART 1 GENERAL

1.01 REFERENCES

.1 American Society of Mechanical Engineers International (ASME)

.1 ASME B16.15-2024, Cast Copper Alloy Threaded Fittings: Classes 125 and 250.

.2 ASME B16.18-2021, Cast Copper Alloy Solder Joint Pressure Fittings.

.3 ASME B16.22-2021, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

.4 ASME B16.24-2016, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.

.2 ASTM International (ASTM)

.1 ASTM A307-21, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

.2 ASTM B88M-20, Standard Specification for Seamless Copper Water Tube (Metric).

.3 American Water Works Association (AWWA)

.1 AWWA C111/A21.11-23, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.4 Ontario Regulation 332/12 Ontario Building Code.

.5 CSA Group (CSA)

.1 CSA B242-05(R2021), Groove and Shoulder Type Mechanical Pipe Couplings.

.6 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.8 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

.1 MSS SP-80-2019, Bronze Gate, Globe, Angle and Check Valves.

.9 National Research Council (NRC)/Institute for Research in Construction

.2 NRCC 47668, National Plumbing Code of Canada (NPC) - 2020.

.10 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

.11 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S101-14, Fire Endurance Tests of Buildings Construction and Materials.

.2 CAN/ULC-S102.2-2018-REV1, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.

.3 CAN/ULC-S115-2018, Standard Method of Fire Tests of Firestop.

.4 CAN/ULC S101-14-REV1, Fire Endurance Tests of Buildings Construction and Materials.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

1.03 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management:

.1 Separate and recycle waste materials in accordance with Section 01 74 19.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

PART 2 PRODUCTS

2.01 PIPING

.1 Domestic hot and cold systems, within building.

.1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.

2.02 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ASME B16.24.

.2 Cast bronze threaded fittings, Class 125 and 250: to ASME B16.15.

.3 Cast copper, solder type: to ASME B16.18.

.4 Wrought copper and copper alloy, solder type: to ASME B16.22.

.5 NPS 2 and larger: roll grooved to CSA B242.

2.03 JOINTS

.1 Rubber gaskets, latex-free 1.6 mm thick: to ANSI/AWWA C111.

.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.

.3 Solder: 95/5 tin copper alloy.

.4 Teflon tape: for threaded joints.

.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.

.6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.04 BALL VALVES

.1 NPS 2 and under, screwed:

.1 Class 150.

.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified Section 23 05 23.01.

.2 NPS 2 and under, soldered:

.1 To ASME B16.18, Class 150.

.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFEseat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23.01.

PART 3 EXECUTION

3.01 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.02 INSTALLATION

.1 Install in accordance with NPC, Ontario Building Code and local authority having jurisdiction.

.2 Install pipe work in accordance with Section 23 05 05, supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ASME standards.

.4 Install DCW piping below and away from DHW and other hot piping so as to maintain temperature of cold water as low as possible.

.5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

3.03 VALVES

.1 Isolate fixtures and branches with ball valves.

3.04 PRESSURE TESTS

.1 Conform to requirements of Section 23 05 00.

.2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.05 FLUSHING AND CLEANING

.1 Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean to Federal potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

3.06 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that air chambers, expansion compensators are installed properly.

3.07 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction and approval of DCC Representative.

.2 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

3.08 START-UP

.1 Timing: Start up after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:

.1 Establish circulation and ensure that air is eliminated.

.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.

.3 Monitor piping DHW and DCW piping systems for freedom of movement, pipe expansion as designed.

.4 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.09 PERFORMANCE VERIFICATION

.1 Scheduling:

.1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.

.2 Procedures:

.1 Verify that flow rate and pressure meet Design Criteria.

.2 TAB DHW and DCW in accordance with Section 23 05 93.

.3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.

.4 Verify performance of temperature controls.

.5 Verify compliance with safety and health requirements.

.6 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.

.7 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

3.10 OPERATION REQUIREMENTS

.1 Provide detail specification requirements for operation and maintenance requirements including, cleaning and maintenance of specified materials and products for this project or co-ordinate with Section 23 05 05.

.2 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 00.

3.11 CLEANING

.1 Clean in accordance with Section 01 74 00.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Sections 01 74 00.

END OF SECTION

PART 1 GENERAL

1.01 REFERENCES

.1 ASTM International Inc.

.1 ASTM B32-08(2014), Standard Specification for Solder Metal.

.2 ASTM B306-20, Standard Specification for Copper Drainage Tube (DWV).

.3 ASTM C564-14, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 National Research Council (NRC)/Institute for Research in Construction.

.1 National Plumbing Code of Canada (NPC) 2015.

.3 Canadian Standards Association (CSA International).

.1 CSA B137 Series-20, Thermoplastic Pressure Piping Compendium.

.2 CSA B70:19, Cast Iron Soil Pipe, Fittings and Means of Joining.

.3 CSA B125.3-18, Plumbing Fittings.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.03 DELIVERY, STORAGE AND HANDLING

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

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates paddling and packaging materials in accordance with Section 01 74 00.

PART 2 PRODUCTS

2.01 COPPER TUBE AND FITTINGS

.1 Above ground sanitary and vent Type DWV to: ASTM B306.

.1 Fittings.

.1 Cast brass: to CSA B125.3.

.2 Wrought copper: to CSA B125.3.

.2 Solder: lead free, tin-copper alloy 95:5, type TA, to ASTM B32.

2.02 CAST IRON PIPING AND FITTINGS

.1 Buried sanitary and vent minimum NPS 3, to: CSA B70, with one layer of heavy bituminous protective coating.

.1 Mechanical Joints:

.1 Provide hub less soil pipe couplings designated as heavy weight, constructed of extra wide 4 to 6 band corrugated type 304 stainless steel bands, with heavy duty worm drive clamps.

.2 Flanged gasket to be made of neoprene rubber, meeting ASTM C564.

.3 Tightened to 9.0 N-m torque.

.2 Above ground sanitary and vent: to CSA B70.

.1 Joints:

.1 Provide hub less soil pipe couplings designated as heavy weight, constructed of extra wide 4 to 6 band corrugated type 304 stainless steel bands, with heavy duty worm drive clamps.

.1 Flanged gasket to be made of neoprene rubber, meeting ASTM C564.

.2 Tightened to 9.0 N-m torque.

PART 3 EXECUTION

3.01 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.02 INSTALLATION

.1 In accordance with Section 23 05 05.

.2 Install in accordance with National Plumbing Code of Canada, Ontario Plumbing Code and local authority having jurisdiction.

.3 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space and to grade as indicated.

.4 Support of piping to be in accordance with NPC.

3.03 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.04 PERFORMANCE VERIFICATION

.1 Cleanouts:

.1 Ensure accessible and that access doors are correctly located.

.2 Open, cover with linseed oil and re-seal.

.3 Verify that cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (sanitary, vent, etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.05 CLEANING

.1 Clean in accordance with Section 01 74 00.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00.

END OF SECTION

PART 1 GENERAL

1.1 TRIAL USAGE

.1 DCC Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

1.2 PROTECTION OF OPENINGS

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

1.3 PAINTING

.1 To Section 09 91 23.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

1.4 SPARE PARTS

.1 Furnish spare parts in accordance with Section 01 78 00 as indicated in each section.

1.5 SPECIAL TOOLS

.1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 01.

.2 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.6 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Where specified elsewhere in Divisions 21, 22 and 23, manufacturers to provide demonstrations and instructions.

.3 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Where deemed necessary, Departmental Representative may record these demonstrations on video tape for future reference.

1.7 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00.

.2 Operation and maintenance manual to be approved by, and final copies deposited with, DCC Representative before final inspection.

.3 Operation data to include:
.1 Control schematics for each system including environmental controls.
.2 Description of each system and its controls.
.3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
.4 Operation instruction for each system and each component.
.5 Description of actions to be taken in the event of equipment failure.
.6 Valves schedule and flow diagram.
.7 Colour coding chart.

.4 Maintenance data shall include:
.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:
.1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
.2 Equipment performance verification test results.
.3 Special performance data as specified elsewhere.
.4 Testing, adjusting and balancing reports as specified in Section 23 05 93.

.6 Approvals:
.1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by DCC Representative.
.2 Make changes as required and re-submit as directed by the DCC Representative.

.7 Additional data:
.1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

1.8 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00.

.2 Shop drawings and product data shall show:
.1 Mounting arrangements.
.2 Operating and maintenance clearances (e.g. access door swing spaces).

.3 Shop drawings and product data shall be accompanied by:
.1 Detailed drawings of bases, supports, and anchor bolts.
.2 Acoustical sound power data, where applicable.
.3 Points of operation on performance curves.
.4 Manufacturer to certify as to current model production.
.5 Certification of compliance to applicable codes.

1.9 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of fans and new and existing ductwork in area of work.

1.10 AS-BUILT DRAWINGS

.1 Site records as per 01 78 00.

.2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection at all times.

.2 As-built drawings:
.1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of as-built drawings.
.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
.3 Submit to DCC Representative for approval and make corrections as directed.
.4 TAB to be performed using as-built drawings.
.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.3 Submit copies of as-built drawings for inclusion in final TAB report.

1.11 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 11.

.2 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

.3 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.4 Dispose of corrugated cardboard, polystyrene, plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

1.12 HALOCARBONS

.1 Comply with Federal Halocarbon Regulations 2003 under the Canadian Environmental Protection Act 1999, EPAM.

1.13 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 All materials and equipment shall be delivered, handled and stored subject to the provisions contained herein and according to the manufacturer's recommendations.

.2 Provide temporary storage facilities and heated storage where required for sensitive items such as motors.

.3 Equipment, including pumps and motors, shall not be placed in temporary or final locations in the new structures before a date approved by the Engineer. The date of delivery into the structure shall be commensurate with the construction progress and the suitability, with respect to temperature, humidity, etc. of the building.

.4 Take precautions to maintain equipment in good condition and to avoid corrosion or other damage which may affect the equipment's performance. Provide temporary coatings as required to prevent corrosion.

.5 Leave factory covers in place and prevent entry of foreign materials into working parts of equipment.

.6 Protect members and bearings with plastic covers.

.7 Grease all shafts and sheaves to prevent corrosion.

.8 The Contractor shall recognize the time interval required for complete construction before the structure is suitable for equipment installation. If equipment is manufactured before it is required at the site, the Contractor shall provide suitable heated dry storage space for the equipment, to the approval of the DCC Representative. All equipment and motors shall be rotated at least weekly during the storage period, and after installation, until the equipment is placed in normal use.

.9 All material damaged or otherwise harmfully affected during delivery, storage, handling or installation shall be replaced by the Contractor at his/her own expense.

1.14 EQUIPMENT REQUIREMENTS AND INSTALLATIONS

.1 Unions or flanges: provide for ease of maintenance and disassembly.

.2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.

.3 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines.

.4 Provide new materials and equipment of proven design, quality and of current models with published ratings for which replacement parts are readily available. Materials and equipment must be free from blemishes, oxidation, damage, etc.

.5 The following definitions shall apply to all sections and drawings of Division 21, 22 and 23.
.1 "CONCEALED" - mechanical services and equipment in hung ceilings and non-accessible chases and furred spaces.
.2 "EXPOSED" - will mean "not concealed" as defined herein (e.g. mechanical rooms).
.3 "PROVIDE" - will mean supply, installation and connection.

.6 Uniformity:
.1 Use product of one manufacturer unless otherwise specified, for equipment or material of the same type of classification.
.2 Installation:
.1 Unless otherwise specified, follow manufacturer's recommendations for safety, adequate access for inspection, maintenance and repairs.
.2 Permit equipment maintenance and disassembly with minimum disturbance to connecting piping and duct systems without interference with building structure or other equipment.
.3 Lubrication:

.1 Provide accessible lubricating means for bearings, including permanent lubrication "Lifetime" bearings.

.7 Provide and install all necessary vibration control components.

.8 Install mechanical work in advance of concrete pouring as necessary.

.9 Install all equipment with adequate access for inspections and servicing.

.10 Employ only skilled tradesmen properly licensed by the Province of Ontario, for all work requiring tradesmen with special skill.

.11 Motors shall be aligned, shimmed and coupled to fit shafts, to the tolerances given by the manufacturer.

.12 Set equipment in place and install piping, fittings, valves and other items. Make final adjustments in alignment and elevation before securely fastening equipment and other items in place.

.13 Control alignment so that excess forces are not imposed on equipment when piping connections are tightened.

.14 Do not tighten pipes until grout is set.

.15 Tighten so that there are no excessive stresses set up in flanges.

.16 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.

.17 Equipment drains: pipe to floor drains, or funnel floor/hub drains.

1.15 INSTALLATION, INTERFERENCE AND SETTING DRAWINGS

.1 Installation, interference and setting drawings dimensioned and to scale, shall be submitted for review to the Consultant, as may be required or requested by the Consultant to make clear the work intended or to show its relation to adjacent work or to the work of other trades. When an alternative piece of equipment is to be substituted for equipment shown, drawings of the area involved shall be prepared by this division. Three copies of such drawings shall be submitted for review, of which one will be retained by the Consultant.

.2 Installation working drawings to 1:50 scale for the mechanical room showing plan and sections of the plant, services, bases, curbs, drains, motor terminals, shall be prepared by this division.

.3 Interference drawings are required for shafts, ceiling spaces and wherever there is possible conflict in the positioning of mechanical equipment, piping, ductwork sub-trades or architectural features.

1.16 EQUIPMENT SUPPORTS ANCHORS AND BASES

.1 The Contractor shall provide all structural work required for foundation and support of units, foundation bolts, sleeves, washers, nuts, shims and templates to locate bolts.

.2 Anchor bolts shall be set in concrete with one end of the bolt hooked as detailed; or sleeved anchor bolts as detailed may be set in concrete. Expansion type bolts drilled into concrete may not be used in lieu of anchor bolts.

.3 Provide seismic restraint of equipment, ducting, piping, tanks and machinery in accordance with Section 44 02 41 - Seismic Restraints.

.4 Provide all necessary mechanical equipment vibration control, specified or recommended by supplier.

.5 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 150 mm high and 150 mm larger than equipment dimensions all around. Concrete shall be as specified in Section 03 30 00 - Cast-in- Place concrete. Housekeeping pads for equipment shall be the responsibility of Division 3.

.6 Provide a minimum of 25 mm non-metallic grout between bedplates and concrete foundation, fill voids, finish and remove wedges after grout is set. Grout shall be non-metallic type.

.7 Where grouting is required for bedplates and equipment bases on concrete foundations, the surface of the concrete foundation shall be roughened to provide a bond.

.8 All bases shall be finished to match the floor.

.9 Equipment supports not by equipment manufacturer: fabricate from structural grade steel meeting the requirements of Section 05 12 23 - Structural Steel. Submit structural calculations with shop drawings.

.10 Prior to connecting pumping units or other equipment to pipe sections, support complete piping assembly and anchor in perfect alignment with pumping units and sleeves to prevent movement of piping assembly and strain on pumping and equipment.

.11 Support all valves and risers so that weight of valve or valve assembly is not carried by adjacent horizontal pipe sections.

.12 Do not secure supports to metal decks when supporting piping, ductwork and other equipment. Provide supplementary steel supported from structural members as required to support piping, ductwork and other equipment where suitable structural members do not exist.

1.17 INSTALLATION, INTERFERENCE AND SETTING DRAWINGS

.1 Installation, interference and setting drawings dimensioned and to scale, shall be submitted for review to the DCC Representative, as may be required or requested by the DCC Representative to make clear the work intended or to show its relation to adjacent work or to the work of other trades. When an alternative piece of equipment is to be substituted for equipment shown, drawings of the area involved shall be prepared by this division. Three copies of such drawings shall be submitted for review, of which one will be retained by the DCC Representative.

.2 Installation working drawings to 1:50 scaled for the mechanical room showing plan and sections of the plant, services, bases, curbs, drains, motor terminals, shall be prepared by this division.

.3 Interference drawings are required for shafts, ceiling spaces and wherever there’s, if possible, conflict in the positioning of mechanical equipment, piping, ductwork sub-trades or architectural features.

1.18 ELECTRICAL

.1 Electrical work to conform to Division 26 including the following.

.2 Provide all controls, disconnects, magnetic starters, transformers, relays, wiring and panels for all motors and devices for packaged equipment as indicated in various specification sections.

.3 Electrical equipment shall bear CSA labels and/or ULC approvals to comply with local power utility's requirements. Conform to the requirements of the Canadian Electrical Code, National Building Code, local, municipal and provincial authorities.

.4 Control panels to be complete with barriered numbered terminal strip for interconnecting of conductors between master control panel and remote control panel and associated equipment.

.5 Controls

.1 All power and control wiring, relays, transformers and wiring related to controllers, sensors, control panels and control devices, which are related to control systems to be provided by Division 23, unless specifically indicated otherwise.

.2 **All wiring shall be run in conduit.**

.3 Control wiring to be copper conductor type RW 90 (XLPE); minimum #14 AWG for power circuits and minimum #18 AWG for control only.

.4 Conduit to be E.M.T. minimum 20mm complete with compression couplings. Provide ground conductor in all conduit runs.

.5 Use liquid tight flexible conduit for final connection to motorized dampers and vibrating equipment.

.6 Ensure that Division 26 has provided for auxiliary contacts for the building control systems.

1.19 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 If delivery of specified motor will delay delivery or installation of any equipment, install motor approved by DCC Representative for temporary use. Final acceptance of equipment will not occur until specified motor is installed.

.3 Motors under 373 W (½ hp): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.4 Motors 373 W (½ hp) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C, 3 phase, 575 V, unless otherwise specified or indicated.

.5 Motor controllers and all electrical wiring unless otherwise shown shall be provided under Division 26. Factory installed wiring and equipment in packaged units to be compatible with external control power; and connecting terminals shall be clearly identified.

.6 Polyphase motors shall be squirrel cage induction of CEMA Design B for fans and pumps.

.7 Where motor type, power, speed or other essential data are not specified, obtain this information from the manufacturer of the equipment and have it approved before ordering motors.

.8 CEMA standards shall be taken as minimum requirements for motor design and performance.

.9 All motors shall be NEMA open-drip-proof unless specified otherwise.

.10 All motors shall be specially selected for quiet operation and high efficiency and compatible with variable speed drives (where applicable).

.11 Motors shall be rated for continuous duty and full load. The maximum rise in temperature shall not exceed 40°C for open-drip-proof and 55°C for totally enclosed.

.12 Motors shall be capable of withstanding momentary overloads of 50% without injurious overheating.

.13 Motors for belt drive shall have adjustable bases with set screws to maintain belt tensions. Motors for direct drive shall be dowelled at base plate at two points.

.14 Motor shall have legible nameplates giving manufacturer's name, shop number, watts, rpm, current characteristics.

.15 Motor enclosures: suitable for service and location specified in project. Obtain information from manufacture and have it approved before ordering.

.16 Terminal box: coordinate dimensions and locations with Electrical Work. Locate box clear of motor ventilation opening.

1.20 SLEEVES

.1 Pipe sleeves: at points where pipes pass through masonry, concrete, fire rated assemblies, floors/grating, and as indicated.

.2 Schedule 40 stainless steel pipe, type 304L.

.3 Stainless steel (type 304L) sleeves with annular fin continuously (type 304L) welded at midpoint:
.1 Through foundation walls.
.2 Where sleeve extends above finished floor.

.4 Sizes: maximum 6 mm clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Terminate sleeves flush with surface of concrete and masonry walls. Terminate sleeves 100 mm above floors.

.6 Fill voids around pipes:
.1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.
.2 Where sleeves pass through walls or floors, provide space for firestopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.
.3 Ensure no contact between copper tube or pipe and ferrous sleeve.
.4 Fill future-use sleeves with lime plaster or other easily removable filler.
.5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M-Amdt.

.7 This Division shall prepare sleeving drawings indicating the size and locations of openings required in concrete floor slabs, roof slabs/decks and walls for piping and equipment. In case of failure to provide information in time (i.e. before the concrete is poured) any extras incurred shall be at the expense of this Division.

.8 Pipe sleeves at points where pipes pass through concrete walls into tanks to be modular mechanical type, complete with stainless steel wall sleeve, consisting of interlocking synthetic rubber links shaped to continuously fill space between pipe and wall opening. The rubber sealing elements to expand and provide an absolute watertight seal between the pipe and wall opening.

.9 Coordinate all pipe sleeve locations with Division 03. Penetrations through structural walls/floors/etc. that compromise the integrity of the structure, shall be reinforced so that original design loads are maintained.

1.21 ESCUTCHEONS

.1 On pipes passing through walls, partitions, floors and ceilings in finished areas.

.2 Type 302 stainless steel, one piece type with set screws.

.3 Outside diameter to cover opening or sleeve.

.4 Inside diameter to fit around finished pipe.

.5 Do not use split-type escutcheon plates.

.6 Secure to pipe on finished surface but not insulation.

.7 Escutcheon must cover fire stop device if firestop device is visible within finished room.

1.22 TESTS

.1 Give 72 h written notice of date for tests.

.2 Insulate or conceal work only after testing and approval by Departmental Representative.

.3 Conduct tests in presence of DCC Representative.

.4 Bear costs including retesting and making good.

.5 Piping:

.1 General: maintain test pressure without loss for 4 h unless otherwise specified.

.2 Hydraulically test steam and hydronic piping systems at 1-1/2 times system operating pressure or minimum 862 kPa, whichever is greater.

.3 Test drainage, waste and vent piping to National Building Code and authorities having jurisdiction.

.4 Test domestic hot, cold and recirculation water piping at 1-1/2 times system operating pressure or minimum 862 kPa, whichever is greater.

.5 Test fire systems in accordance with NFPA and authorities having jurisdiction and as specified elsewhere.

.6 Equipment: test as specified in relevant sections.

.7 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

.8 Provide written confirmation for each test conducted.

.9 Provide any equipment required to conduct tests.

.10 Test water shall be potable water and should be from a municipal system that treats water with chlorination or some other appropriate means to kill bacteria.

1.23 ACCESS DOORS

.1 Supply access doors to concealed mechanical equipment for operating, inspecting, adjusting and servicing.

.2 Flush mounted 300 mm x 300 mm for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps. Access doors located in inmate accessible areas shall be security type c/w tamper proof security screwdriver latches.

.3 Material:
.1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by DCC Representative.
.2 Remaining areas: use prime coated steel.

.4 Installation:
.1 Locate so that concealed items are accessible.
.2 Locate so that hand entry is achieved.
.3 Installation by General Contractor.

.5 Fire rated access panels: 16 ga. mounting frame, 20 gauge sandwich type insulated self-closing door with concealed hinge, 50mm thickness of fire rated insulation in door, self-latching ring pull latch, primer coated, 1½ hour rating. Access doors located in inmate accessible areas shall be security type c/w tamper proof security screwdriver latches.

.6 Access doors must maintain fire rating if installed in a fire rated assembly. Refer to Architectural Drawings for location of fire rated walls and ceilings.

.7 Furnish and locate access doors for concealed valves, traps, strainers, cleanouts, balancing and fire dampers, air vents and other parts requiring accessibility for service and maintenance.

1.24 DRAIN VALVES

.1 Locate at low points and at section isolating valves unless otherwise specified.

.2 Minimum NPS 3/4 unless otherwise specified with hose end male thread and complete with cap and chain.

1.25 DIELECTRIC COUPLINGS

.1 General:
.1 To be compatible with and to suit pressure rating of piping system.
.2 Where pipes of dissimilar metals are joined.

.2 Pipes NPS 2 and under: isolating unions.

.3 Pipes NPS 2-1/2 and over: isolating flanges.

1.26 CUTTING, PATCHING & MAKING GOOD

.1 All cutting and patching shall be by the Contractor.

.2 Division 21, 22 and 23 shall advise the trade responsible for cutting, in advance of the time required, of the location and extent of cutting required, and any other pertinent information.

.3 Division 21, 22 and 23 shall advise the trade responsible for patching and finishing of any pertinent information, such as clearance requirements around equipment.

.4 Costs arising to correct work due to failure to provide coordination information on time, incorrect sizes or locations or other pertinent information, shall not be extra to the Contract.

1.27 MECHANICAL SYSTEM SHUTDOWN

.1 Comply with RMC shutdown procedures.

.2 Connections into existing systems to be made at time acceptable to DCC Representative. Request written approval of time when connections can be made.

.3 Where connections are made to existing services, existing insulation shall be made good under this division.

1.28 EXAMINATION OF SITE AND INFORMATION

.1 Material and equipment shall be brought into the building in such assemblies and sizes as to enter into the spaces where they are to be located and to be small enough to be hoisted into the building without difficulty. Any cutting, patching, etc. involved in getting large assemblies into place shall be the responsibility of the Contractor.

1.29 CO-ORDINATION

.1 Locate distribution systems, equipment and materials to provide minimum interference and maximum useable space.

.2 Where interference occurs, DCC Representative shall review relocation of equipment and materials for approval or rejection.

.3 This contractor shall notify other Subcontractors who are concerned, of all openings, foundation work, hangers, inserts, anchors, or other provisions necessary in their work for the installation of this work and he shall furnish all information and necessary materials in ample time so that proper provisions can be made for same, and shall supply and correctly and accurately place all inserts sleeves, anchors, etc.

.4 Where anchors are required to be drilled and placed, Division 23 shall be responsible for their supply and installation. Pipe hangers and supports listed in Section 23 05 29 shall be provided by Division 23.

1.30 HOISTING AND RIGGING

.1 In accordance with the construction schedule provide and arrange for transportation, of all equipment and materials to site, and for the rigging, hoisting, storing and setting in place of equipment.

1.31 GUARANTEE

.1 Contractor shall guarantee all material and workmanship used in the work to be in strict accordance with the specifications, of best quality and type obtainable to give first-class construction and proper and efficient operation, and free from any defects. Any such defects which may appear in any of the work within one year after written acceptance of this work shall be repaired and replaced by the Contractor without additional expense to the Contract. Where such defects occur, Contractor shall be held responsible for all costs incurred in making the defective work good.

.2 This shall not obsolete any longer warranties on specific items of equipment.

.3 All change to adjacent work, particularly plaster, wood finishes or other materials, or damage to other equipment, caused by such defects of this contractor's work or by subsequent replacement and repairs, shall be made good at the expense of this contractor. All repair work shall be done by trades responsible for the original work.

1.32 REVIEW/ TAKEOVER PROCEDURES

.1 Conform to Division 01.

.2 Substantial performance will not be considered until the following items have been completed to the Departmental Representative's satisfaction.

.1 All systems are complete and operational.

.2 All systems have been commissioned and successfully passed testing over the entire range of their operating capacities under automatic control. (Note: seasonal or environmental conditions resulting in the delay of some testing will be accommodated by issuance of conditional certificate).

.3 Commissioning and testing reports.

.4 Air balancing reports.

.5 "As built" and/or record drawings and specifications.

.6 Operations and Maintenance Manuals.

.7 The DCC Representative, operating and maintenance personnel have received training on all systems and equipment.

1.33 TSSA AND CRN

.1 The contractor shall hire a 3rd party reviewer for all steam, condensate, gas, venting, combustion air, controls and associated equipment/installations. The 3rd party shall be qualified to inspect the proceeding items to the requirements of TSSA and CRN. The contractor shall follow all 3rd party requirements and provide all items, modifications, controls, trim documentation, etc.

.2 Whenever indicated, items to be designed to TSSA/CRN requirements, shall be designed to these requirements, reviewed by the 3rd party receiver and modified as above.

.3 Any mention of TSSA or CRN requirements in divisions 21, 22 or 23 shall mean when TSSA or CRN requirements would apply to a system which is installed in non-government facilities. The facility shall meet requirement of government and non-government building requirements.

1.34 CERTIFICATES, PERMITS AND FEES

.1 The contractor shall give all necessary notices, obtain all required permits, and pay all fees, in order that the work herein specified may be carried out, and he shall furnish any certificates needed as evidence that the work installed conforms with the laws and regulations of the Municipality and Province and as approved by the local utility.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED $END

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.01 SUBMITTALS

.1 Submit shop drawings/product data sheets for all products specified in this Section except shop fabricated ductwork and fittings.

.2 Include capacity, throw and terminal velocity, noise criteria, and pressure drops with grille and diffuser shop drawing/product data sheet submission.

.3 With shop drawing/product data sheet submission, supply evidence that fire rated duct manufacturer is ULC listed to size requirements shows on drawings.

.4 Submit duct leakage test data prior to ductwork being covered from view.

.5 Submit manufacturer's colour chart(s) for all items for which a finish colour is to be selected.

.6 Submit proper installation certification from fire rated duct manufacturer as specified in Part 3 of this Section.

.7 Supply and hand to Owner at Substantial Performance of the Work, a minimum of 10 identified (with tags) grille/diffuser volume control damper adjustment keys.

1.02 QUALITY ASSURANCE

.1 Grilles and diffusers are to be tested and performance certified to ANSI/ASHRAE 70, Method of Testing the Performance of Air Outlets and Air Inlets.

2 PRODUCTS

2.01 GALVANIZED STEEL DUCTWORK

.1 Galvanized steel sheet is to be hot dipped in accordance with requirements of ASTM A653. G60 galvanizing for bare uncovered duct to be finish painted. G90 for all other galvanizing.

.2 Rectangular

.1 Lock forming grade hot dip galvanized steel, ASTM A653, shop fabricated, minimum #26 gauge.

.3 Round

.1 Factory machine fabricated, spiral, mechanically locked flat seam, single wall duct, fittings and couplings.

.4 Flat Oval

.1 Factory machine fabricated, single wall, 4-ply spiral lock seam duct, fittings and couplings.

2.02 FLEXIBLE METALLIC DUCTWORK

.1 Bare

.1 Spirally wound, semi-rigid, self-supporting corrugated aluminum duct with continuous triple lock seams, SMACNA Form "M-UN", ULC S110 listed and labelled as a Class 1 Air Duct, constructed of dead soft aluminum strip, and supplied in 3 m (10') lengths.

.2 Insulated

.1 Spirally wound, semi-rigid, self-supporting corrugated aluminum duct with continuous triple lock seams, SMACNA Form "M-I", ULC S110 listed and labelled as a Class 1 Air Duct, constructed of dead soft aluminum strip, supplied in 3 m (10') lengths and factory covered with 40 mm (1-1-2") thick, 12 kg/m^3 (0.75 lb/ft^3) density fibreglass insulation with a Mylar jacket meeting 25/50 flame spread and smoke developed requirements tested in accordance with CAN/ULC S102.

2.03 FLEXIBLE CONNECTION MATERIAL

.1 Waterproof, indoor-outdoor type flexible connection material meeting requirements of NFPA 90A, consisting of woven glass fibre fabric coated on both sides with synthetic rubber. Acceptable products are:

.1 Duro Dyne Canada Inc. "DUROLON";

.2 Dyn Air Inc. "HYPALON".

2.04 METAL DUCT SYSTEM JOINT SEALANT

.1 ULC listed and labelled, premium grade, grey colour, water base, non-flammable duct sealer, brush, or gun applied, with a CAN/ULC S102 tested maximum flame spread rating of 5 and smoke developed rating of 0.

.2 Acceptable manufacturers are:

.1 Johns Manville;

.2 Manson Insulation;

.3 Knauf Insulation.

2.05 ACOUSTIC LINING

.1 Minimum 25 mm (1") thick acoustic lining material meeting 25/50 flame spread and smoke developed ratings tested in accordance with CAN/ULC S102, meeting NFPA 90A, ASTM C1071, and ASTM G21 requirements, not supporting microbial growth, flexible for round ducts, board type for rectangular ducts, consisting of a bonded fiberglass mat coated on inside (airside) face with a black fire-resistant coating.

.2 Acceptable manufacturers are:

.1 Johns Manville;

.2 Manson Insulation;

.3 Knauf Insulation.

2.06 CASING AND PLENUM MATERIAL AND ACCESSORIES

.1 Unless otherwise specified, casing and plenum material is to be same as connecting duct material.

.2 Accessories such as access doors and drain pans are to be constructed of same material as casing and plenum and are to be in accordance with Chapter 6 of SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.07 PLENUM ACCESS DOORS

.1 Factory fabricated, double wall insulated access doors, sized as indicated on drawings, and constructed of same material as connecting ductwork in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible to suit operating pressure of the system.

2.08 ROUND TO RECTANGULAR DUCT CONNECTIONS

.1 Equal to Flexmaster Canada Ltd. galvanized steel, flared, flanged or notched "Spin-On" round duct take-off collars with locking dampers in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.09 SPLITTER DAMPERS

.1 Minimum #20 gauge damper blade constructed of same material as duct, reinforced as required to suit blade size, system velocity, and to prevent "chatter", and complete with operating hardware equal to DynAir Inc. #Q-50 "DYN-A-QUAD S-S" quadrant regulator with RW-50 backup washers to prevent leakage, long square bearing pin, and slide pin.

2.10 AIR TURNING VANES

.1 For square elbows, multiple-radius turning vanes interconnected with bars, adequately reinforced to suit pressure and velocity of system, constructed of same material as duct they are associated with, and in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

.2 For short branch ducts at grille and diffuser connections, air extractor type each equipped with a matching bottom operated 90° opposed blade volume control damper, constructed of same material as duct it is associated with and in accordance with requirements and details in ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.11 MANUAL BALANCING (VOLUME) DAMPERS

.1 Flanged and drilled, single or parallel blade (depending on damper size) manual balancing dampers, each constructed of same material as connecting ductwork unless otherwise specified, each designed to maintain internal free area of connecting duct, and each complete with:

.1 hexagonal or square shaft extension through frame;

.2 non-stick, non-corrosive synthetic bearings for rectangular dampers, flange stainless steel bearings for round dampers;

.3 blade stops for single blade dampers, designed to prevent blade from moving more than 90°;

.4 linkage for multiple blade dampers;

.5 locking hand quadrant damper operator with, for insulated ducts 50 mm (2") standoff mounting.

.2 Rectangular Dampers: Nailor Industries Inc. 1800 Series, maximum size 1.2 m x 1.2 m (4' x 4') for a single damper.

.3 Round Dampers: Nailor Industries Inc. Model 1890, maximum 600 mm (24") diameter, equipped with a minimum 200 mm (8") deep frame, and blade stiffeners where required.

.4 Multiple Rectangular Damper Section Assembly: Rectangular assembly supplied with the dampers or site constructed, of same material as damper and designed for tight and secure mounting of individual dampers.

.5 Acceptable manufacturers are:

.1 Nailor Industries Inc.;

.2 T.A. Morrison & Co. Inc. "TAMCO";

.3 NCA Manufacturing Ltd.;

.4 Greenheck Fan Corp.;

.5 Ruskin Co.

2.12 BACKDRAFT DAMPERS

.1 Nailor Industries Model 1370CB counterbalanced backdraft dampers, vertical or horizontal mounting, 50 mm (2") wide, sized as shown and complete with:

.1 extruded 6063-T5 aluminum frame, 2.3 mm (0.090") nominal wall thickness, with mitred corners;

.2 extruded 6063-T5 aluminum blades, 1.3 mm (0.050") nominal wall thickness on 92 mm (3-5/8") centres, and with extruded PVC blade seals;

.3 corrosion-resistant synthetic bearings;

.4 adjustable plated steel counterweights mounted internally in the airstream;

.5 concealed blade linkage located out of the airstream.

.2 Acceptable manufacturers are:

.1 Nailor Industries Inc.;

.2 T.A. Morrison & Co. Inc. "TAMCO";

.3 NCA Manufacturing Ltd.;

.4 Greenheck Fan Corp.;

.5 Ruskin Co.

2.13 COMBINATION FIRE/SMOKE DAMPERS

.1 ULC listed to CAN/ULC S112 and CAN/ULC S112.1, meeting requirements of NFPA 80, 90A, 92, 101 and 105, consisting of type A, B, or C fusible link fire dampers as required and a fail-safe, opposed blade, normally closed, motor operated smoke damper complete with factory installed and tested 120 V electric actuator.

.2 ULC 1-1/2 hour fire rated and ULC Class I leakage rated for smoke, and equipped with a 74°C (165°F) ULC classified fusible link that will cause damper to close and lock independent of actuator when duct temperature reaches maximum temperature of damper assembly.

.3 Supply damper with factory installed sleeves of minimum 400 mm (16") length, field verified by contractor dependent on wall thickness. Caulk sleeves to ULC requirements and constructed of 20 gauge for sizes up to 2.1 m (84") wide and 18 gauge for sizes greater than 2.1 m (84") wide.

2.14 DUCT ACCESS DOORS

.1 In accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, with sizes suitable in all respects for purpose for which they are provided, and, unless otherwise specified, constructed of same material as duct they are associated with.

2.15 DUCTWORK DRAIN POINTS

.1 Equal to Ductmate Canada Ltd. "Moisture Drain", 20 mm (3/4") diameter moisture drains with galvanized sheet metal funnel, and chrome plated brass threaded drain, nut and cap.

2.16 INSTRUMENT TEST PORTS

.1 Equal to Duro-Dyne of Canada Ltd. #IP1 or #IP2 (to suit insulation thickness where applicable) gasketed, leakproof instrument test ports for round or rectangular ducts as required, each complete with a neoprene expansion plug and a plug securing chain.

2.17 WIRE MESH (BIRDSCREEN)

.1 Heavy-gauge galvanized steel or aluminum mesh, 12 mm x 12 mm (1/2" x 1/2") secured in a rigid galvanized steel or aluminum framework, sized as indicated on drawings, and constructed so as to be removable.

3 EXECUTION

3.01 CLEANLINESS REQUIREMENTS FOR HANDLING AND INSTALLATION OF DUCTWORK

.1 Handle and install ductwork in accordance with SMACNA's Duct Cleanliness for New Construction Guidelines at the Advanced Level.

3.02 FABRICATION AND INSTALLATION OF GALVANIZED STEEL DUCTWORK

.1 Provide required ductwork, rectangular, round and/or flat oval. Where rectangular ductwork is shown, round or flat oval ductwork of equivalent cross-sectional area is acceptable.

.2 It is to be understood that all duct dimensions shown on drawings are clear internal dimensions.

.3 Unless otherwise specified, construct and install ductwork in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible to suit duct pressure class designation of minimum 500 Pa (2" w.c.) positive or negative as applicable, a minimum velocity of 10 m/s (2000 fpm), and so ductwork does not "drum". Flat surfaces of rectangular ductwork are to be cross-broken. Duct system sealing is to meet ANSI/SMACNA Seal Class A requirements.

.4 Variable air volume ductwork from supply fans to boxes is as above but rectangular duct take-offs are double side straight taper type with a take-off length equal to 0.5 times the branch duct width but minimum 150 mm (6") length, and double taper side is to have an included angle of minimum 60°.

.5 Confirm routing of all ductwork at site and site measure ductwork prior to fabrication. Duct dimensions may be revised to suit site routing and building element requirements, if dimension revisions are reviewed with and approved by Consultant. Duct routing and/or dimension revisions to suit conditions at site are not grounds for a claim for an extra cost.

.6 Refer to structural drawings. Where ductwork is to be run within or through open web steel joists, ductwork shown on mechanical drawings is schematic only and is to be altered as required to suit steel joist configuration, spacing, panel points, and cross-bridging at no additional cost.

.7 Wherever ductwork is required at locations where sprayed fireproofing is applied to building construction, install ductwork only after fireproofing work is complete and do not compromise fire rating of sprayed fireproofing.

.8 Install (but do not connect) duct system mounted automatic control components supplied as part of the automatic control work.

.9 Where indicated, provide duct connections to fan powered heat transfer equipment with integral coils.

.10 Flange connect ductwork to hot water reheat coils in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible. Coils will be suspended independent of connecting ductwork as part of the heat transfer work.

.11 Support horizontal rectangular ducts inside building in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, but use trapeze hangers with, unless otherwise specified, galvanized steel channels, and galvanized steel hanger rods for exposed ducts and concealed ducts wider than 500 mm (20"). Support hardware constructed of same material as duct for metal duct, and, unless otherwise specified, type 316 stainless steel for non-metal duct. Supports for "heavy" duct such as cementitious core duct is to be suitable in all respects for the application and approved by Consultant.

.12 Support round and flat oval ducts inside building in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, but, unless otherwise specified, for both uninsulated and insulated ducts exposed in finished areas, use bands and secure at top of duct to a hanger rod, all similar to Ductmate Canada Ltd. type "BA". If duct is insulated, size strap to suit diameter of insulated duct. Unless otherwise specified, duct support hardware for metal duct is constructed of same material as duct, and for non-metal duct, type 316 stainless steel.

.13 Where flanged duct joints are used, do not locate joints in wall or slab openings, or immediately at wall or slab openings. Do not use flanged joints for exposed uninsulated ducts in finished areas.

.14 Where watertight horizontal ductwork is required, construct ducts without bottom longitudinal seams. Solder or weld joints of bottom and side sheets. Seal all other joints with duct sealer. Slope horizontal duct to hoods, risers, or drain points. Provide drain points. Provide watertight ductwork for:

.1 ductwork outside building or otherwise exposed to the elements;

.2 dishwasher exhaust;

.3 shower exhaust ducts from grilles to duct main or riser;

.4 minimum of 3 m (10') upstream and downstream of duct mounted humidifiers or humidifier manifolds;

.5 fresh air intakes;

.6 wherever else shown.

.15 Leakage Testing:

.1 Upon failure of satisfactory sealing of joints in ductwork from a visual examination, Consultant may require additional testing of duct leakage in accordance with SMACNA HVAC Duct Leakage Test Manual to verify leakage does not exceed leakage class 24 for a 500 Pa. (2 in.) pressure class. Two percent maximum leakage.

.2 Perform leakage tests in sections.

.3 Make trial leakage tests as instructed to demonstrate workmanship.

.4 Install no additional ductwork until trial test has been passed.

.5 Test section minimum of 30 m (100 ft.) long with not less than 3 branch takeoffs and 2 90^0 elbows.

.6 Complete test before insulation or concealment.

.16 Seal all ductwork in accordance with SMACNA Seal Class "A", except for round duct with self-sealing gasketed fittings and couplings which does not require site applied sealant. Apply sealants by brush or gun to cleaned metal surfaces. Where bare ductwork is exposed apply neat uniform lines of sealant. Randomly brushed, sloppy looking sealant applications will be rejected and must be repaired or replaced with a neat application of sealant.

.17 Apply sealants by brush or gun to cleaned metal surfaces. Where bare ductwork is exposed apply neat uniform lines of sealant. Randomly brushed, sloppy looking sealant applications will be rejected and must be repaired or replaced with a neat application of sealant.

.18 Clean exterior exposed (uninsulated) ducts and coat with a heavy full coverage of Bakor #410-02 black metal paint.

.19 Where dissimilar metal ducts are to be connected, isolate ducts by means of flexible duct connection material.

.20 Round exposed ductwork in Gymnasium is to be 2 metal gauges heavier than standard metal gauge for same size duct, and duct hangers are to be pairs of 9.5 mm (3/8") diameter hanger rods secured to 40 mm (1-1/2") wide #12 gauge galvanized steel split clamps around full circumference of duct at maximum 1.8 m (72") centres. Provide double nuts and lock washers on each hanger rod above and below each clamp.

.21 Equip ducts with a dimension of 600 mm (24") and larger and located in mechanical equipment rooms of any kind with hanger rods equipped with double deflection neoprene rod isolation hangers properly sized for associated load. Also refer to Section entitled Seismic Control and Restraint.

3.03 INSTALLATION OF ALUMINUM DUCTWORK

.1 Provide aluminum ductwork, rectangular or round.

.2 Provide aluminum ductwork for:

.1 Dryer venting.

.3 Wherever bare aluminum ductwork comes in contact with ferrous metal or copper, paint ferrous metal or copper surface with a heavy, 100% covering coat of zinc chromate paint, asphalt paint or otherwise isolate direct contact with the bare aluminum.

.4 Refer to "Commentary on Aluminum Ducts" in ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, however, do not use drive and S cleats for joining waterproof aluminum ductwork. Use following SMACNA joining methods:

.1 T-21 - welded flange;

.2 T-22 - companion angle and gasket;

.3 T-24A - flanged.

.5 Keep longitudinal joints at top surface of horizontal runs. Provide proper transverse supports to prevent deflection. Ensure duct is rigid.

.6 When mastic is used for sealing, such as sealing longitudinal joints, apply mastic to both surfaces before they are mated. When dry, apply mastic again for a water-tight seal.

.7 Install wall mounted lint trap inline with ductwork within the room where the dryer is located. Lint trap shall be coordinated with layout of dryer and ducting.

3.04 INSTALLATION OF FLEXIBLE DUCTWORK

.1 Provide maximum 1.5 m (5') long lengths of flexible ductwork for connections between galvanized steel duct mains and branches, and necks of ceiling grilles and diffusers. Do not install flexible ductwork through walls, even if shown on drawings.

.2 At rectangular galvanized steel duct, accurately cut holes and provide flanged or "Spin-in" round flexible duct connection collars. Seal joints with duct sealer.

.3 Install flexible ducts as straight as possible and support in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, and secure at each end with nylon or stainless steel gear type clamps, and seal joints. Provide long radius duct bends where they are required.

.4 Do not penetrate fire barriers with flexible duct.

3.05 INSTALLATION OF ACOUSTIC LINING

.1 Provide acoustic lining in ductwork in locations as follows:

.1 wherever shown and/or specified on drawings;

.2 supply ductwork downstream of air terminal boxes for a distance of 2.4 m (8') measured along duct and outward from box in all directions;

.3 all transfer air ducts.

.2 Install lining in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, however, for all installations regardless of velocity, at leading and trailing edges of duct liner sections, provide galvanized steel nosing channel in accordance with detail entitled Flexible Duct Liner Installation found in the ANSI/SMACNA manual referred to above.

3.06 INSTALLATION OF CASINGS AND PLENUMS

.1 Provide required shop or site fabricated casings and plenums. Unless otherwise specified or shown, construct casings and plenums of same material as connecting duct system.

.2 Construct and install casings and plenums in accordance with Chapter 6 of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible to suit systems' pressure classification. Ensure plenums and casings secured to building structure are gasketed air-tight and equipped with angle reinforcing.

.3 Provide drain pans with accessible trapped drains for fresh air intake plenums, and wherever else shown.

3.07 INSTALLATION OF CASING AND PLENUM ACCESS DOORS

.1 Provide access doors into all site or shop fabricated casings and plenums requiring access, and wherever shown.

.2 Construct access doors to open in or out to suit positive and negative pressures of system.

.3 Provide pitot tube openings in access doors where required for system air quantity balancing purposes.

.4 Provide suitably sized, engraved, red-white laminated Lamacoid warning nameplates on access doors into casings and plenums where equipment is located, i.e. fans.

3.08 INSTALLATION OF ROUND TO RECTANGULAR DUCT CONNECTIONS

.1 Cut round holes in rectangular ducts and provide round to rectangular lock-in fittings with dampers for connection of flexible round ductwork.

3.09 INSTALLATION OF SPLITTER DAMPERS

.1 Provide splitter dampers in supply ductwork at branch duct connections off supply air mains, and wherever else shown and/or specified on drawings. Install splitter dampers so they cannot vibrate and rattle and so damper operation mechanisms are in an easily accessible and operable location. Ensure operators for dampers in insulated ducts are equipped with stand-off mounting brackets.

3.10 INSTALLATION OF TURNING VANES

.1 Provide turning vanes in ductwork elbows where shown on drawings and wherever else required where, due to site installation routing and duct elbow radius, turning vanes are recommended in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

3.11 INSTALLATION OF MANUAL BALANCING (VOLUME) DAMPERS

.1 Provide manual balancing dampers as required to provide a fully balanced system, including but not limited to in all open end ductwork, in all duct mains, and wherever else shown and/or specified.

.2 Install dampers so operating mechanism is accessible and positioned for easy operation, and so dampers cannot move or rattle. Ensure operating mechanisms for dampers in insulated ducts are complete with stand-off mounting brackets.

.3 Where a duct for which a balancing damper is required has dimensions larger than dimensions of maximum size volume damper available, provide multiple dampers bolted together in a properly sized assembly, or bolted to a heavy-gauge black structural steel angle or channel framework which is properly sized. Seal to prevent air by-pass, and provide connecting linkage.

.4 Confirm exact damper locations with personnel doing air quantity balancing testing work and install dampers to suit. Include for providing 5 additional dampers at no additional cost.

3.12 INSTALLATION OF BACKDRAFT DAMPERS

.1 Provide backdraft dampers.

.2 Install and secure dampers so they cannot move or rattle.

3.13 INSTALLATION OF FUSIBLE LINK DAMPERS

.1 Provide fusible link dampers. Ensure damper rating (1-1/2 or 3 hr.) is suitable for fire barrier it is associated with.

.2 Install dampers with retaining angles on all 4 sides of sleeve on both sides of damper and connect with ductwork in accordance with damper manufacturer’s instructions and details, and Code requirements.

.3 Provide expansion clearance between damper or damper sleeve and opening in which damper is required. Ensure openings are properly sized and located, and all voids between damper sleeve and opening are properly sealed to maintain rating of fire barrier.

.4 Where size of fire barrier opening requires use of a sectionalized fire damper assembly, provide multiple fusible link dampers (sized to CAN/ULC S112) bolted together in a properly sized assembly or bolted to a heavy-gauge black structural steel angle or channel framework.

3.14 INSTALLATION OF COMBINATION FIRE/SMOKE DAMPERS

.1 Provide combination fire/smoke dampers. Install dampers with retaining angles on all 4 sides of each side of damper, and, where required, connect with ductwork, all in accordance with damper manufacturer’s instructions and details, and Code requirements.

.2 Coordinate damper installation with electrical work where electrical connections to damper actuators are specified.

3.15 INSTALLATION OF SMOKE DAMPERS

.1 Provide smoke dampers. Install dampers with retaining angles on all 4 sides of sleeve on both sides of damper and connect with ductwork in accordance with damper manufacturer's instructions and details, and Code requirements.

.2 Coordinate damper installation with electrical work where electrical connections to damper actuators are specified.

3.16 INSTALLATION OF FLEXIBLE CONNECTION MATERIAL

.1 Provide a minimum of 100 mm (4") of flexible connection material where ducts, plenums, and/or easings connect to fans, and wherever else shown or specified.

.2 Rigidly secure a minimum of 75 mm (3") of duct material (minimum #24 gauge) to each edge of flexible fabric and to fan, duct, plenum, etc., in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible. Ensure connections to flexible fabric material are arranged and supported so as to not impose any external forces on the fabric.

3.17 INSTALLATION OF ROOF MOUNTED DUCT SUPPORTS

.1 Supply supports for roof mounted ductwork.

.2 Hand adjustable structural supports to roofing trade on roof for installation and flashing into roof construction as part of roofing work. Accurately mark exact locations and spacing of structural supports and supervise installation. Provide properly sized hot dip galvanized structural steel angles between structural supports and secure in place on support studs. Support ductwork on the angles and provide galvanized steel banding to secure ducts to the angles.

3.18 INSTALLATION OF DUCT ACCESS DOORS

.1 Provide access doors in ductwork for access to all components which will or may need maintenance and/or repair, including reheat coils. Install in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

.2 Identify access doors provided for fusible link damper maintenance with "FLD" stencil painted or marker type red lettering and ensure doors are properly located for damper maintenance.

.3 When requested, submit a sample of proposed duct access doors for review.

.4 Where sectionalized fusible link dampers and/or balancing dampers are provided in large ducts, provide a plenum type access door to suit, and adequately reinforce ductwork to suit access door installed.

3.19 INSTALLATION OF INSTRUMENTS TEST PORTS

.1 Provide instrument test ports in all main ducts at connections to fans, plenums or casings, in all larger branch duct connections to mains, and wherever else required for proper air quantity balancing and testing.

.2 Locate test ports where recommended by personnel performing air quantity testing and balancing work.

3.20 INSTALLATION OF WIRE MESH (BIRDSCREEN)

.1 Provide framed, removable wire mesh panels over openings in ducts and/or walls where shown and/or specified on drawings. Rigidly secure in place but ensure panels are removable.

.2 Provide wire mesh panels for open-end return air ducts in ceiling spaces whether shown on drawings or not.

3.21 INSTALLATION OF LOUVRES

.1 Provide louvres for wall openings.

.2 Install louvre assemblies and secure in place in accordance with manufacturer's instructions and details.

.3 Confirm exact louvre sizes and finish prior to ordering.

3.22 INSTALLATION OF BRICK AND BLOCK VENTS

.1 Supply brick or block vents for installation in exterior walls.

.2 Hand assemblies to masonry trade for installation.

.3 Accurately mark exact locations and coordinate installation.

3.23 INSTALLATION OF GRILLES AND DIFFUSERS

.1 Provide grilles and diffusers. Wherever possible, grilles and diffusers are to be product of same manufacturer.

.2 Unless otherwise specified connect grilles and diffusers in accordance with requirements of SMACNA HVAC Duct Construction Standards Metal and Flexible.

.3 Exactly locate grilles and diffusers to conform to final architectural reflected ceiling plans and detailed wall elevations, and to conform to final lighting arrangement, ceiling layout, ornamental and other wall treatment.

.4 Equip supply diffusers having a basic 4-way or all round air pattern for operation in 1-, 2-, or 3-way pattern where indicated on drawings.

.5 Provide sheet metal plenums, constructed of same material as connecting duct, for linear grilles and/or diffusers where shown. Construct and install plenums in accordance with requirements of SMACNA HVAC Duct Construction Standards Metal and Flexible. Where individual sections of linear grilles or diffusers are not equipped with a volume control device, equip duct connection collar(s) with volume control device(s).

.6 Where linear type diffusers/grilles are installed in suspended T-bar ceilings, clip diffusers/grilles in place using clip supplied by diffuser/grille manufacturer.

.7 Confirm grille and diffuser finishes prior to ordering.

3.24 SUPPLY OF DOOR GRILLES

.1 Supply door grilles as shown and scheduled.

.2 Hand grilles to appropriate trade at site for installation.

3.25 DUCT SYSTEM PROTECTION, CLEANING AND START-UP

.1 Temporarily cover all open ends of ducts during construction.

.2 Remove all dirt and foreign matter from entire duct systems and clean duct system terminals and interior of air handling units prior to operating fans.

.3 Prior to starting any supply air handling system provide 50 mm (2") thick glass fibre construction filters at fan equipment in place of permanent filters.

.4 Provide cheesecloth over duct system inlets and outlets and run system for 24 hours, after which remove cheesecloth and construction filters, and install new permanent filters.

.5 Include all labour for a complete site walk-through with testing and balancing personnel following route of all duct systems to be tested, adjusted and balanced for the purpose of confirming proper position and attitude of dampers, location of pitot tube openings, and any other work affecting testing and balancing procedures. Perform corrective work required as a result of this walk-through.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

.1 This Section covers items common to Sections of Division 26, and 28. This section supplements requirements of Division 01.

1.2 CODES AND STANDARDS

.1 Do complete installations in accordance with CSA C22.1:24 except where specified otherwise.

1.3 CARE, OPERATION AND START-UP

.1 Instruct DCC representative and operating personnel in the operation, care and maintenance of equipment.

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

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

1.4 VOLTAGE RATINGS

.1 Operating voltages: to CSA C235:19.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Safety Authority and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees in accordance with Division 1 – General Requirements.

.3 DCC representative will provide drawings and specifications required by Electrical Safety Authority and Supply Authority at no cost.

.4 Notify DCC representative of changes required by Electrical Safety Authority prior to making changes.

.5 Furnish Certificates of Acceptance from Electrical Safety Authority or authorities having jurisdiction on completion of work to DCC representative.

1.6 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Section 01 33 00 – Submittal Procedures.

.2 Review of shop drawings, product date, or samples submitted by the Contractor shall not relieve the Contractor of responsibility for deviations from requirements of the contract documents, unless the contractor has specifically informed the DCC Representative in writing of such deviation at time of submittal, and the DCC Representative has given written approval of the specific deviation. The Contractor shall continue to be responsible for deviations from requirements of the contract documents not specifically noted by the Contractor in writing, and specifically approved by the DCC Representative in writing.

.3 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from the DCC Representative. Provide for cost of field inspections to certify equipment as required by CSA C22.1:24.

.4 Factory assemble control panels and component assemblies.

1.7 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Provide all Motor, Control and Equipment components and wiring for a complete and operational system, except as specifically noted on drawings.

.2 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical specifications and shown on mechanical drawings.

1.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1-1955.
- .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

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

1.9 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and/or labels as follows:

.2 Nameplates:
- .1 2-ply or 3-ply laminated engraved plastic material 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

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

.3 Wording on nameplates and labels to be approved by DCC representative prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate and label.

.5 Identification to be English.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets pull boxes and junction boxes: indicate system, voltage, and circuit numbers.

.8 Transformers: indicate equipment name, capacity, primary and secondary voltages.

1.10 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or 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 code: to CSA C22.1:24.

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

1.11 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, box covers, and metallic sheathed cables.

.2 Code by prepainting couplings, connectors and boxes.

.3 Colours:

Service	Colour
up to 250 V	yellow
up to 600 V	brown
Telephone	green
Fire alarm	red
Emergency voice	orange

1.12 WIRING TERMINATIONS

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.13 MANUFACTURERS AND CSA LABELS

.1 Visible and legible after equipment is installed.

1.14 SINGLE LINE ELECTRICAL DIAGRAMS

.1 Provide fire alarm riser diagram, plan and zoning of building at fire alarm control panel and remote annunciators.

1.15 LOCATION OF OUTLETS

.1 Locate the outlets in accordance with 01 11 00 – Summary of Work / General Instructions.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes. Allow 600 mm horizontal clearance in fire-rated partitions in accordance with NBCC.

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

.4 Locate light switches on latch side of doors. Locate disconnect devices in mechanical rooms on latch side of door.

1.16 MOUNTING HEIGHTS

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

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

.3 Install electrical equipment at following heights unless indicated otherwise.
- .1 Local switches: 1100 mm.
- .2 Wall receptacles:
  - .1 General: 610mm or match existing.
  - .2 Above top of continuous baseboard heater: 200 mm.
  - .3 Above top of counters or counter splash backs: 175 mm.
  - .4 In mechanical rooms: 1100 mm.
- .3 Panelboards: With uppermost overcurrent device operating handle not higher than 1700 mm AFF in accordance with CSA C22.1.
- .4 Telephone and interphone outlets: 610 mm or match existing.
- .5 Wall mounted telephone and interphone outlets: 1100 mm.
- .6 Fire alarm stations: 1100 mm.
- .7 Wall mounted fire alarm signalling devices: 2000 mm.
- .8 Television outlets: 610 mm or match existing.
- .9 Doorbell pushbuttons: 1100 mm.
- .10 Emergency lighting units: not less than 2000 where practical.

1.17 LOAD BALANCE

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.18 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

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

1.19 FIELD QUALITY CONTROL

.1 Conduct and pay for following tests:
- .1 Circuits originating from branch distribution panels: voltage.
- .3 Lighting and its control.
- .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
- .5 Systems: fire alarm system, communications.
- .6 After systems have been tested, provide demonstration of each system. Demonstration to be conducted by manufacturer’s representative.

.2 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions and applicable standards.

.3 Insulation resistance testing.
- .1 Measure with megohmmeter circuits, feeders and equipment up to 350 V with a 500 V instrument. Testing of individual branch circuits rated 30A or less not required.
- .2 Check resistance to ground before energizing.
- .3 Carry out tests in presence of DCC Representative.

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

.5 Submit test results for Engineer's review.

1.20 CAN/ULC S1001 INTEGRATED SYSTEMS TESTING AND VERIFICATION

.1 Include for hiring an Integrated Testing Coordinator (ITC) to provide the following.

.1 Produce draft integrated systems testing plans to be submitted to the AHJ for review at project commencement.

.2 Provide updated final integrated systems plans based on latest contract documents.

.3 Once all integrated systems have been installed, tested individually, and preliminary integrated systems testing completed with all intended functions operating correctly with no errors, ITC is to attend final integrated systems testing with all other required contractors, and complete final integrated systems testing plans. Plans to be signed off by ITC, and all contractors required for integrated systems testing for this project.

.4 The integrated testing coordinator shall be knowledgeable and experienced in the design, installation, and operation of fire protection and life safety system(s), and the fire protection and life safety functions of building systems.

.5 The integrated testing coordinator shall have knowledge and understanding of:

.1 The Codes and Standards that regulate the design and installation of fire protection and life safety system(s);

.2 How individual and integrated fire protection and life safety system(s) are designed to operate during normal operating conditions and emergency conditions; and

.3 Methods for validating the intended functionality of integrated fire protection and life safety system(s).

.6 The integrated testing coordinator shall have all licenses and certifications if required by:

.1 Federal, provincial, territorial or other applicable regulations; and/or

.2 Contractual obligations.

.2 Be responsible for allowing for all costs associated with CAN/ULC S1001 integrated systems testing, including but not limited to, pre-testing to ensure systems function correctly prior to final testing, coordination of other trades, etc.

.3 Be responsible for arranging and chairing meetings with all other trades which have life safety systems tied into the fire protection and life safety systems to ensure systems are integrated and tested in accordance with CAN/ULC S1001.

1.21 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

1.22 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials including corrugated cardboard, polystyrene, and plastic packaging material in accordance with Section 01 74 00 – Cleaning.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Ensure emptied containers are stored safely for disposal away from children.

.4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.5 Fold up metal banding, flatten and place in designated area for recycling.

1.23 DEMOLITION AND REMOVAL

.1 Separate and recycle waste materials in accordance with Section 01 74 00 – Cleaning.

.2 Divert unused metal and wiring materials from landfill to metal recycling facility.

.3 The full extent of the demolition is not shown on the drawings. The Electrical Contractor shall carry in his tender price eighty (80) net total licensed electrician hours required to complete the work, including supervision, OH&P, and miscellaneous associated costs. These manhours shall be used for removal, relocation, or resupport of equipment, devices, or conduits which are not specifically identified on the tender documents. Review in advance all removals, relocations, and supports provided under this allowance with the DCC Representative. All work to be performed during regular working hours (not premium time).

1.24 COMMUNICATION REQUIREMENTS

.1 The following are two highlighted requirements for communications equipment, conduit and wiring.
- .1 All conduits shall be electrical metallic tubing (EMT). Flexible metallic conduit is not permitted, except for drop from junction box for individual devices in wall or ceiling. Length of drop not to exceed 4m. PVC shall not be used unless encased in 50mm concrete or run below grade.
- .2 Minimum communications conduit size is 21mm (3/4”).
- .3 No run of conduit shall exceed 30 meters or contain more than two 90 degree bends or a combination of bends totalling more than 180 degrees between pull points or pull boxes.
- .4 Provide pull string in all empty conduits.

PART 2 – PRODUCTS

(not applicable)

PART 3 – EXECUTION

(not applicable)

END OF SECTION

1.0 GENERAL

1.01 SUMMARY

.1 This Section includes requirements for selective demolition and removal of electrical components including removal of conduit, junction boxes, and panels to source (home run removal) and incidentals required to complete work described in this Section ready for new construction.

1.02 RELATED REQUIREMENTS

.1 Section 02 41 19- Selective Demolition

1.03 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.3 Remove and Salvage: Detach items from existing construction and deliver them to DCC Representative ready for reuse.

.4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.

.6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

.1 Action Submittals: Provide in accordance with Section 01 33 00 – Submittal Procedures before starting work of this Section:

.1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Waste Management and Disposal

.2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.05 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

.2 Scheduling: Account for DCC Representative's continued occupancy requirements during selective demolition with Section 02 41 19 - Selective Demolition and schedule staged occupancy and worksite activities as a defined in Section 01 32 16.19 - Construction Progress Schedule.

1.06 QUALITY ASSURANCE

.1 Regulatory Requirements: Perform work of this Section in accordance with:

.1 Federal Workers' Compensation Service

.2 Government of Canada, Labour Program: Workplace Safety

1.07 SITE CONDITIONS

.1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition on date that tender is accepted.

.2 Existing Hazardous Substances: Hazardous substances will be removed by a hazardous abatement specialist engaged by DCC Representative before start of Work.

.3 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in Work; immediately notify DCC Representative if materials suspected of containing hazardous substances are encountered and perform following activities:

.1 Refer to Section 02 41 19 – Selective Demolition for directives associated with specific material types.

.2 Hazardous substances will be as defined in Hazardous Products Act.

.3 Stop work in area of suspected hazardous substances.

.4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.

.5 Hazardous substances will be removed by DCC Representative under a separate contract or as a change to Work.

.6 Proceed only after written instructions have been received from DCC Representative.

1.08 SALVAGE AND DEBRIS MATERIALS

.1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain DCC Representative's property.

.2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials in accordance with Section 02 41 19 – Selective Demolition.

2.0 PRODUCTS

2.01 MATERIALS

.1 General Patching and Repair Materials: Refer to Section 02 41 19 - Selective Demolition for listing of patching and repair materials incidental to removal or demolition of components associated with work of this Section.

.2 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed

.3 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

3.0 EXECUTION

3.01 EXAMINATION

.1 Verification of Existing Conditions: Thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; DCC Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.02 PREPARATION

.1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:

.1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.

.2 Notify DCC Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

.3 Prevent debris from blocking drainage inlets.

.4 Protect mechanical systems that will remain in operation.

.2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the DCC Representative and users is minimized and as follows:

.1 Prevent debris from endangering safe access to and egress from occupied buildings.

.2 Notify DCC Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.03 EXECUTION

.1 Demolition and Removal: Coordinate requirements of this Section with information contained in Section 02 41 19 - Selective Demolition and as follows:

.1 Remove existing emergency lights, electrical devices and equipment including associated conduits, boxes, wiring, and similar items unless noted otherwise, such as, where branch circuit conductors mabe be retained in the same location where new unit is installed in te same location as old unit.

.2 Disconnect and remove existing fire alarm system including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise. Provide new wiring and conduit to maintain existing to remain circuits and devices to ensure there are no joints in the affected circuits.

.3 Perform demolition work in a neat and workmanlike manner:

.1 Remove tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.

.2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.

.4 Remove existing conduits, boxes, cabling and wiring associated with removed electrical devices and equipment that are not replaced.

.5 Grind off conduits and make flush with surface of concrete where conduits are cast into concrete; seal open ends of conduit with silicone sealant and leave in place.

.6 Seal open ends of conduit with silicone sealant and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

3.04 CLOSEOUT ACTIVITIES

.1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use in new.

.2 Hazardous Substances Disposal: Arrange for disposal of hazardous substances.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 REFERENCES

.1 CSA C22.2 No. 65-18 (R2022) Wire Connectors (Trinational standard with NMX-J-543-ANCE and UL 486A-486B), Includes Update No. 1 (2019), Update No. 2 (2021), and Update No. 3 (2023).

.2 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors: with current carrying parts of copper, copper alloy, sized to fit copper as required.

.2 Fixture type splicing connectors: with current carrying parts of copper, copper alloy sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
- .1 Connector body and stud clamp for stranded, round, copper, aluminum conductors, tube, bar.
- .2 Clamp for stranded, round copper conductors, bar.
- .3 Clamp for stranded aluminum, ACSR conductors, round aluminum bar.
- .4 Stud clamp bolts.
- .5 Bolts for copper conductors, bar.
- .6 Bolts for aluminum conductors, bar.
- .7 Sized for conductors, tubes, bars as indicated.

.4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:
- .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
- .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
- .3 Install fixture type connectors and tighten. Replace insulating cap.
- .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

.2 Section 26 05 20 - Wire and Box Connectors (0 - 1000 V).

1.2 REFERENCES

.1 CSA C22.2 0.3-09 (R2023), Test Methods for Electrical Wires and Cables, Includes Update No. 1 (2010).

.2 CSA C22.2 131-17 (R2022), Type TECK 90 Cable.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

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

Insulation:
- .1 For system voltage rated less than 250V, size as indicated, with 600V insulation of chemically cross-linked thermosetting polyethylene (XLPE) material rated RW90.
- .2 For system voltage rated 250 to 750V, size as indicated, with 1000V insulation of chemically cross-linked thermosetting polyethylene (XLPE) material rated RW90.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No.131-2014 – Type Teck 90 Cable.

.2 Conductors:
- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size as indicated.
- .3 Minimum size 12 AWG.

.3 Insulation:
- .1 Type: ethylene propylene rubber.
- .2 Chemically cross-linked thermosetting polyethylene rated type RW90, 1000V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: flat, interlocking galvanized aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride material.

.7 Connectors:
- .1 Watertight, approved for TECK cable.

2.3 ARMOURED CABLES

.1 Conductors :
- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size as indicated.
- .3 Minimum size 12 AWG.

.3 Cable Type: AC90
- .1 Armour: interlocking type fabricated from galvanized steel, aluminum strip.

2.4 CONTROL CABLES

.1 Cable Type LVT:
- .1 2 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket

.2 Low energy 300 V control and instrumentation cable (CIC): solid stranded annealed copper conductors sized as indicated, with PVC insulation type TW -40°C TWH polyethylene insulation with shielding. Individually twisted shielded pairs complete with overall shield.

2.5 FIRE ALARM CABLES

.1 Cable Type FAS 105:
- .1 Type FAS 105-300V soft annealed copper conductors in conduit. 4 conductor type or 2 conductor type with separate bond wire.
- .2 Initiating Circuits:
  - .1 Minimum 18 AWG.
  - .2 In dedicated initiating circuit conduit.
- .3 Signalling Circuits (strobe):
  - .1 Minimum 12 AWG
  - .2 In dedicated signalling circuit conduit.
- .4 Speaker Circuits:
  - .1 Minimum 14 AWG.
  - .2 In dedicated signalling circuit conduit, complete with shield when run in same conduit as strobe circuits.

PART 3 - EXECUTION

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:
- .1 In conduit systems in accordance with Section 26 05 34.

3.2 INSTALLATION OF TECK CABLE 0 - 1000 V

.1 Install cables.

.2 Group cables wherever possible on channels.

.3 Terminate cables in accordance with this Section.

3.3 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with this Section.

3.4 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 REFERENCES

.1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Grounding.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive underground ground grid.

.2 Grounding conductors: bare stranded copper, soft annealed, size as required.

.3 Insulated grounding conductors: green, type RW90.

.4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 Install separate ground conductor to outdoor lighting standards.

.7 Connect building structural steel and metal siding to ground by welding copper to steel.

3.2 EQUIPMENT GROUNDING

.1 Install grounding/bonding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, distribution equipment, transformers, frames of motors, starters, disconnect switches, control panels, building steel work.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 Common Work Results For Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - Product

2.1 SUPPORT CHANELS

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

.2 Hot dip galvanized type in damp or wet locations.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Secure equipment to hollow and solid masonry, tile and plaster surfaces with lead anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic support channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.
- .1 One-hole malleable iron or steel straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.
- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of DCC representaive.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 – PRODUCTS

2.1 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.2 CABINETS

.1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.

.2 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing 19 mm G1S fir plywood sheet steel backboard for surface mounting.

PART 3 - EXECUTION

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.2 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Install size 2 identification labels indicating system, equipment name, voltage and phase or circuit numbers.

END OF SECTION

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 REFERENCES

.1 CSA C22.1:24 Canadian Electrical Code, Part 1.

PART 2 - PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Provide stainless steel coverplates. Stainless steel blank coverplates for boxes without wiring devices.

.5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm. Surface mount fire alarm pull station backbox supplied by fire alarm manufacturer.

.3 102mm square or octagonal outlet boxes for lighting fixture outlets.

.4 102mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster tile walls.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-glavanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 SURFACE MOUNTED CONDUIT BOXES

.1 Cast FS or FD aluminum or feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.6 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

.1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.7 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 32 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 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)
- .1 CSA C22.2 No. 18.2-2006 (R2022), Outlet Boxes, Conduit Boxes, and Fittings.
- .2 CSA C22.2 No. 56-17 (R2022), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .3 CSA C22.2 No. 83-M1985 (R2022), Electrical Metallic Tubing.

PART 2 - PRODUCTS

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No.83, with couplings with expanded ends.

.2 Flexible metal conduit: to CSA C22.2 No.56, aluminum liquid-tight flexible metal. Liquid tight type in damp or wet locations.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits NPS 2 and smaller. Two hole steel straps for conduits larger than NPS 2.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1.5m on-centre.

.4 Threaded rods: 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90° bends are required for NPS 1 and larger conduits.

.3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

.4 Steel couplings for fire alarm conduits.

.5 Factory “ells” not permitted on communication conduits.

2.4 FISH CORD

.1 Polypropylene.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms in unfinished areas.

.3 Use electrical metallic tubing (EMT) with steel couplings for fire alarm system.

.4 Use flexible metal conduit for connection to recessed incandescent fixtures without a prewired outlet box connection, to surface or recessed fluorescent fixtures or work in movable metal partitions.

.5 Use liquid tight flexible metal conduit for connection to motors or vibrating.

.6 Minimum conduit size for lighting and power circuits: NPS 3/4. Minimum conduit size for communication distribution: NPS 1.

.7 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.8 Mechanically bend steel conduit over 21 mm dia.

.9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.10 Install fish cord in empty conduits.

.11 Run 2-NPS 1 spare conduits up to ceiling space and 2-NPS 1 spare conduits down to ceiling space from each flush panel. Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.

.12 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.13 Dry conduits out before installing wire.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop drawings to include electrical details of panel, branch breaker type, quantity, ampacity and enclosure dimension.

PART 2 - PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: Product of one manufacturer see drawing for details.
- .1 Install circuit breakers in panelboards before shipment.
- .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250 V panelboards: bus and breakers rated for 10,000 A (symmetrical) interrupting capacity or as indicated.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Two keys for each panelboard and key panelboards alike.

.6 Copper bus with neutral of same ampere rating as mains.

.7 Mains: suitable for bolt-on breakers.

.8 Trim with concealed front bolts and hinges.

.9 Trim tub and door finish: baked grey enamel.

.10 Flush panels to be NEMA type 1 enclosure with lockable door and trim.

.11 Surface panels in sprinklered floor areas to be NEMA type 2 complete with lockable door and trim and drip hood.

2.2 BREAKERS

.1 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Complete circuit directory with typewritten legend showing location and load of each circuit.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Mount panelboards to height specified in Section 26 05 00- Common Work Results for Electrical or as indicated.

.3 Connect loads to circuits.

.4 Connect neutral conductors to common neutral bus with respective neutral identified.

.5 Balance loads between phases in accordance with Section 26 05 00 - Common Work Results For Electrical.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 SWITCHES

.1 20 A, 120 V, single pole, double pole, three-way, four-way switches.

.2 Manually-operated general purpose ac switches with following features:
- .1 Terminal holes approved for No. 10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine molding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 Brown toggle.
- .6 Heavy duty spec grade.

.3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features:
- .1 Brown urea molded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Break-off links for use as split receptacles.
- .4 Eight back wired entrances, four side wiring screws.
- .5 Triple wipe contacts and rivetted grounding contacts.
- .6 Heavy duty spec grade.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
- .1 Brown urea molded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

2.3 COVER PLATES

.1 Cover plates for wiring devices.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

.5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Switches:
- .1 Install single throw switches with handle in "UP" position when switch closed.
- .2 Install switches in gang type outlet box when more than one switch is required in one location.
- .3 Mount toggle switches at height specified in Section 26 05 00 – Common Results for electrical Systems or as indicated.

.2 Receptacles:
- .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
- .2 Mount receptacles at height specified in Section 26 05 00 – Common Work Results for electrical Systems or as indicated.
- .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.3 Cover plates:
- .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .2 Install suitable common cover plates where wiring devices are grouped.
- .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00- Submittals.

.2 Include time-current characteristic curves for breakers with ampacity greater or equal to 15 A with interrupting capacity of 22,000 A symmetrical rms and over at system voltage.

PART 2 - PRODUCTS

2.1 BREAKERS GENERAL

.1 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.

.2 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.5 Circuit breakers with interchangeable trips as indicated.

2.2 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

.2 Section 26 05 21 - WIRES AND CABLES (0-1000 V).

.3 Section 26 05 34 - CONDUITS, CONDUIT FASTENINGS AND CONDUIT FITTINGS.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)
- .1 CSA C22.2 No. 141:24, Emergency Lighting Equipment.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Data to indicate system components, mounting method, source of power, and special attachments.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Supply voltage: 120 VAC.

.2 Output voltage: 12 VDC.

.3 Operating time: 60 minutes

.4 Battery: sealed, maintenance free.

.5 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected.

.6 Solid state transfer.

.7 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.8 Signal lights: solid state, life expectancy 100,000 h minimum, for 'AC Power ON' and 'High Charge'.

.9 Lamp heads: integral on unit and remote, 360° horizontal and 180° vertical adjustment. Lamp type: 2 tungsten-halogen 12W MR16, glare free.

.10 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.11 Auxiliary equipment:
- .1 Lamp disconnect switch.
- .2 Test switch
- .3 AC input and DC output terminal blocks inside cabinet.
- .4 Bracket.
- .5 Suitable for direct connection.

.12 Remote Lamp heads: Double head molded thermoplastic, 360° horizontal and 180° vertical adjustment.12W tungsten-halogen.

2.2 WIRING OF REMOTE HEADS

.1 Conduit: EMT, to Section 26 05 34 - CONDUITS, CONDUIT FASTENINGS AND CONDUIT FITTINGS.

.2 Conductors: Minimum 10 AWG type to Section 26 05 21 - WIRES AND CABLES (0-1000 V).

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install unit equipment and remote mounted fixtures as indicated.

.2 Install remote mounted fixtures as indicated.

.3 Direct heads as indicated.

.4 Connect unit equipment to unswitched lighting circuit in area server.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)
- .1 CSA C22.2 No. 141:24, Emergency Lighting Equipment.
- .2 CSA C860-11 (R2020), Performance of Internally-Lighted Exit Signs.

1.3 SUBMITTALS

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

.2 Submit product data sheets for exit lights. Include product characteristics, performance criteria, physical size, limitations, and finish.

.3 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures.

PART 2 - PRODUCTS

2.1 STANDARD UNITS

.1 Exit lights: CSA C22.2 No. 141:24 and CSA C860-11 (R2020), packaged in accordance with the Canadian Code for Preferred Packaging guidelines.

.2 Housing and face plates: extruded one-piece aluminium with clear polycarbonate panel.

.3 White LED light source.

.4 Pictogram ‘running man’ style exit sign.

.5 Universal input voltage: 120-347 VAC; 6-24VDC.

2.2 DESIGN

.1 Universal mounting: end, wall, or ceiling.

.2 Single or double face as indicated on drawings

.3 Adjustable films for pictogram and direction arrow selection. Suitable for left, right, straight direction indication.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install exit lights.

.2 Connect fixtures to exit light circuits.

.3 Connect emergency lamp sockets to emergency circuits.

.4 Ensure that exit light circuit breaker is locked in on position.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 REFERENCES

.1 ULC-524:2019, Installation of Fire Alarm Systems .

.2 ULC-525, Audible Signal Devices for Fire Alarm Systems, Including Accessories.

.3 ULC 526, Visible Signal Devices for Fire Alarm Systems, Including Accessories.

.4 ULC-527, Standard for Control Units for Fire Alarm Systems.

.5 ULC-S528, Manual Stations for Fire Alarm Systems, Including Accessories (CAN/ULC S528-14).

.6 ULC-529, Standard for Smoke Detectors for Fire Alarm Systems.

.7 ULC-530, Standard for Heat Actuated Fire Detectors for Fire Alarm Systems (CAN/ULC S530).

.8 ULC-531, Standard for Smoke Alarms (CAN/ULC S531:2019).

.9 ULC-533, Egress Door Securing and Releasing Devices (CAN/ULC-S533-15).

.10 ULC-536, Inspection and Testing of Fire Alarm Systems.

.11 ULC-537, Verification of Fire Alarm Systems.

.12 ULC-541, Speakers for Fire Alarm Systems, Including Accessories (CAN/ULC-S541).

.13 ULC-S567, Door Closers and Holders

.14 NBCC 2020, National Building Code of Canada 2020.

.15 CAN/ULC-S1001, Integrated Systems Testing of Fire Protection and Life Safety Systems

.16 TSSA-B44, Elevator Recall

1.2 SYSTEM DESCRIPTION

.1 Fully supervised, microprocessor-based, addressable fire alarm system, utilizing digital techniques for data control

.2 System to carry out fire alarm and protection functions; including receiving alarm signals; initiating general alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signalling to monitoring agency.

.3 System to carry out fire alarm voice communication and zoned/all call evacuation

.4 Initiating zones, Class A, Communication/audible zones Class A.

.5 Modular in design to allow for future expansion.

.6 Operation of system shall not require personnel with special computer skills.

.7 System to include:
- .1 Central Control Unit in separate enclosure with power supply, stand-by batteries, central processor with microprocessor and logic interface, main system memory, input-output interfaces for alarm receiving, annunciation/display, and program control/signalling.
- .2 Power supplies.
- .3 Initiating/input circuits.
- .4 Output circuits.
- .5 Auxiliary circuits.
- .6 Wiring.
- .7 Manual and automatic initiating devices.
- .8 Speaker or speaker strobe devices and strobes.
- .9 End-of-line resistors.
- .10 Local annunciator.
- .11 Event log memory chip.
- .12 Wireless transmitter.
- .13 Audio riser distribution amplifiers (70W).

1.3 REQUIREMENTS OF REGULATORY AGENCIES

.1 System components: listed by ULC and comply with applicable provisions of Local/Provincial Building Code, and meet requirements of local authority having jurisdiction.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 11 00 - General Instructions & 26 05 00 – Common Work Results for Electrical.

.2 Include:
- .1 Detail assembly and internal wiring diagrams for control units. Consoles Auxiliary cabinets.
- .2 Overall system riser wiring diagram identifying control equipment initiating zones signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
- .3 Details for devices.
- .4 Details and performance specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.
- .5 Step-by-step operating sequence, cross referenced to logic flow diagram.

1.5 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for fire alarm system for incorporation into manuals.

.2 Include:
- .1 For complete fire alarm system to permit effective operation and maintenance.
- .2 Technical data - illustrated parts lists with parts catalogue numbers.
- .3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.
- .4 List of recommended spare parts for system.

1.6 MAINTENANCE

.1 Provide one year's free maintenance with two inspections by manufacturer during year. Inspection tests to conform to ULC-S536. Submit inspection report to DCC representative.

.2 Include in price on tender form for temporary program changes during construction period, to include zone labels, control functions, system operation.

1.7 TRAINING

.1 Provide 4 hour, on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer. Due to phased replacement and removal and integration with the existing Notifier fire alarm system for single fire alarm call out, new fire alarm system and components to be a Notifier 3030 system.

.2 Power supply: to ULC-524.

.3 Audible signal devices: to ULC-524.

.4 Control unit: to ULC-527.

.5 Manual fire alarm stations: to ULC-528.

.6 Thermal detectors: to ULC-530.

.7 Smoke detectors: to ULC-529.

2.2 SYSTEM OPERATION: SINGLE STAGE - SIGNALS ONLY

.1 Actuation of any alarm initiating device to:
- .1 Cause electronic latch to lock-in alarm state at central control unit.
- .2 Indicate zone of alarm at central control unit and remote annunciator.
- .3 Cause generated tone signal to sound continuously throughout building and at central control unit.
- .4 Cause strobes to flash throughout building.
- .5 Transmit signal to fire department via central station.
- .6 Cause ventilation fans to shut down or to function to provide required control of smoke movement.
- .7 Cause elevators to return to floor of egress, or to alternate floor, as required.

.2 Actuation of supervisory devices to:
- .1 Cause electronic latch to lock-in supervisory state at central control unit
- .2 Indicate respective supervisory zone at central control unit and at remote annunciator.
- .3 Cause audible signal at central control unit to sound.

.3 Resetting alarm, supervisory device not to return system indications/functions back to normal until control unit has been reset. Signal silence to silence tone and leave strobe operating.

.4 Trouble on system to:
- .1 Indicate circuit in trouble at central control unit.

.2 Activate "system trouble" indication, buzzer and common trouble sequence. Acknowledging trouble condition to silence audible indication; whereas visual indication to remain until trouble is cleared and system is back to normal.
.3 Trouble on system to be suppressed during course of alarm.
.4 Trouble condition on any circuit in system not to initiate any alarm conditions.

2.3 CONTROL PANEL

.1 Central control unit (CCU).
.1 Features specified are minimum requirements for microprocessor-based system with digital data control for data transmission.
.2 System to provide for priority reporting levels, with fire alarm points assigned highest priority, supervisory and monitoring lower priority, and third priority for troubles. Possible to assign control priorities to control points in system to guarantee operation or allow emergency override as required.
.3 Integral power supply, battery charger and standby batteries.
.4 Basic life safety software: retained in non volatile Erasable Programmable Read-Only-Memory (EPROM). Extra memory chips: easily field-installed. Random-Access-Memory (RAM) chips in panel to facilitate password-protected field editing of simple software functions (e.g. zone labels, priorities) and changing of system operation software.
.5 Circuitry to continuously monitor communications and data processing cycles of microprocessor. Upon failure, audible and visual trouble indication to activate.
.6 Support up to 2 RS-232-C I/O ports. CCU output: parallel ASCII with adjustable baud rates to allow interface of any commercially available printer, terminal or PC.
.7 Software and hardware to maintain time of day, day of week, day of month, month and year.

2.4 POWER SUPPLIES

.1 Dedicated circuit 120 V, 60 Hz, 5of - 20 Amp as primary source of power for system. Provide circuit locks for Fire Alarm system and Transmitter painted red.

.2 Voltage regulated, current limited distributed system power.

.3 Primary power failure or power loss (less than 102 V) will activate common trouble sequence.

.4 Interface with battery charger and battery to provide uninterruptible transfer of power to standby source during primary power failure or loss.

.5 During normal operating conditions fault in battery charging circuit, short or open in battery leads to activate common trouble sequence and standby power trouble indicator.

.6 Standby batteries: sealed, maintenance free.

.7 Continuous supervision of wiring for external initiating and alarm circuits to be maintained during power failure.

2.5 INITIATING/ INPUT CIRCUITS

.1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors and water flow switches, wired in class A configuration to central control unit c/w line fault isolators.

.2 Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.

.3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".

.4 Receiving circuits for supervisory, N/O devices. Devices: wired in class B configuration to central control unit.

.5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

2.6 ALARM OUTPUT CIRCUITS

.1 Alarm output circuit: connected to signals, wired in class A configuration to central control unit.
- .1 Signal circuits' operation to follow system programming; capable of generating tone signal through speakers and operating strobe lights. Each signal circuit: fuse-protected from overloading/over current.
- .2 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.

2.7 AUXILIARY CIRCUITS

.1 Auxiliary contacts for control functions.

.2 Actual status indication (positive feedback) from controlled device.

.3 Alarm and/or supervisory on system to cause operation of programmed auxiliary output circuits.

.4 Elevator recall to comply to Code TSSA-B44, Elevator Recall.

.5 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.

.6 Auxiliary circuits: rated at 2 A, 24 V dc or 120 V ac, fuse-protected.

2.8 WIRING

.1 Refer to Section 26 05 21.

.2 EMT conduit with steel couplings for all fire alarm wiring.

2.9 MANUAL ALARM STATIONS

.1 Manual pull station.
- .1 Pull lever, semi-flush wall mounted type, English lettering.
- .2 Surface mount boxes for surface devices.
- .3 Surface mounted boxes to be supplied by fire alarm supplier and be listed for use.

2.10 AUTOMATIC ALARM INITIATING DEVICES

.1 Heat detectors,

- .1 Thermal fire detectors, self-restoring rate of rise, fixed temperature 88°C, rate of rise 8.3°C per minute. Surface mounted boxes to be supplied by fire alarm supplier and be listed for use.

.2 Smoke detectors,
- .1 Ionization type dual unipolar sensor.
- .2 Duct mounted detector with housing, sampling tube, LED indicator.

.3 Surface mounted boxes to be supplied by fire alarm supplier and be listed for use.

2.11 SIGNALING DEVICES

.1 Flush or surface speakers or speaker strobe-200 dia. c/w 180A steel white baffle, torsion spring type with 220 x 220 x 125 deep 18GA undercoated to prevent resonance backboxes.

.2 1/4 to 2 watt taps and round baffle, 95 db at 3.5 m.

.3 Output sound level: 94 db at 3 m with 1 W tap.

.4 Strobe UL synchronization 10 milliseconds over 2 Hrs, 110cd at 15m.

.5 Surface mounted boxes to be supplied by fire alarm supplier and be listed for use.

2.12 RESERVED

2.13 END-OF-LINE DEVICES

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

.2 End of line devices to be of verifying type c/w key switch for testing of Class B signalling devices and conventional zones.

.3 All End-of line devices to be installed beside fire alarm control panel. Surface mounted boxes to be supplied by fire alarm supplier and be listed for use.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install systems in accordance with ULC-524.

.2 Install central control unit and connect to ac power supply, ac and dc standby power.

.3 Install manual alarm stations and connect to alarm circuit wiring.

.4 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.

.5 Connect alarm circuits to main control panel.

.6 Install speakers, speaker-strobes and strobe devices, line isolators per unit and connect to signalling circuits.

.7 Connect signalling circuits to main control panel. Install line isolators in corridor ceilings as indicated

.8 Install end-of-line devices at control panel.

.9 Install remote relay units to control fan shut down.

.10 Sprinkler system: wire alarm and supervisory switches and connect to control panel.

.11 Splices are not permitted.

.12 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes and CCU, as required by equipment manufacturer.

.13 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.

.14 Identify circuits and other related wiring at central control unit and terminal boxes.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results For Electrical and ULC-S537 and CAN/ULC S1001.

.2 Fire alarm system:

.1 Test such device and alarm circuit to ensure manual stations, thermal and smoke detectors sprinkler system transmit alarm to control panel and actuate first and second stage alarm ancillary devices.

.2 Check control panel to ensure zones are shown correctly.

.3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of trouble signals.

.3 Provide final PROM program re-burn for DCC representative incorporating program changes made during construction.

.4 Integrated Testing

.1 Engage a Integrated Testing Coordinator to prepare Integrated Testing Plan and provide requirements in accordance with CAN/ULC-S1001.

.2 Include for but not be limited to full review, testing and verification of operation of integrated systems such as fire suppression systems, life safety systems, elevators and their emergency sequence of operation, HVAC equipment, supervisory annunciation of sprinkler/standpipe monitor switches, pressure switches and flow switches, security alarms, BAS alarms, release of door holders and electromagnetic locks, and other integrated components.

.3 Coordinate requirements with trades responsible for integrated components and systems, and arrange trades to be present at time of testing, and verification and commissioning work.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM C117- 23, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing

.2 ASTM C136/C136M- 19, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

.3 ASTM D422-63 63(2007)E2, Standard Test Method for Particle-Size Analysis of Soils

.4 ASTM D698- 12(2021), Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ^{3}) (600 kN-m/m ^{3})

.5 ASTM D4318- 17E1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

.2 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 833/R-06-004, Developing Your Stormwater Pollution Prevention Plan, A Guide for Construction Sites.

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric

.4 CSA Group (CSA):

.1 CSA-A23.1/A23.2- 19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete

.5 Provincial Legislation

.1 Ontario - Occupational Health and Safety Act (OHSA)

.2 O.Reg. 213/91 – Construction Projects

.3 O.Reg.153/04: Records of Site Condition - PART XV.1 of the Act

.4 O.Reg.406/19: On-Site and Excess Soil Management

.6 Ontario Provincial Standard Specifications (OPSS)

.1 OPSS.MUNI 401- November 2021, Trenching, Backfilling, and Compacting

.2 OPSS.MUNI 402-November 2023, Construction Specification for Excavating, Backfilling, And Compacting for Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers

.3 OPSS.MUNI 410- November 2018, Pipe Sewer Installation in Open Cut

.4 OPSS.MUNI 441- November 2021, Construction Specification for Watermain Installation In Open Cut

.5 OPSS.MUNI 517-November 2021, Dewatering.

.6 OPSS.MUNI 511-November 2019, Rip-Rap, Rock Protection and Granular Sheeting

.7 OPSS.MUNI 1004- November 2021, Aggregates - Miscellaneous

.8 OPSS.MUNI 1010- November 2013, Aggregates - Base, Subbase Select Subgrade, and Backfill Material

1.2 PUBLICATIONS

.1 WSP Canada Inc.

.1 Geotechnical Report, titled " Geotechnical Investigation, Proposed ME-46 Building, DCC Project No. HQ1076D1, CCN No. 7" prepared by WSP Canada Inc. dated February 7, 2024, and amended July 19, 2024.

.2 Soil Characterization Report titled, "Soil Characterization Report, 19 Somme Avenue, Proposed Building ME-46, DDC, Project No. HQ1076D1, CCN No. 7, CFB Kingston" prepared by WSP Canada Inc. dated July 16, 2024.

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock: solid material in excess of 1.00 m^3 and which cannot be removed by means of heavy-duty mechanical excavating equipment with 0.95 to 1.15 m^3 bucket. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

.3 Topsoil:

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.

.4 Waste material: Excavated material unsuitable for use in Work or surplus to requirements.

.5 Borrow material: Material obtained from locations outside area to be graded and required for construction of fill areas or for other portions of Work.

.6 Recycled fill material: Material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.7 Unsuitable materials:

.1 Existing fill material, as characterized by the Geotechnical Report. Refer to Geotechnical Report, titled " Geotechnical Investigation, Proposed ME-46 Building, DCC Project No. HQ1076D1, CCN No. 7" prepared by WSP Canada Inc. dated February 7, 2024 and amended July 19, 2024.

.2 Organic Soil.

.3 Weak, chemically unstable, and compressible materials.

.4 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318 , and gradation within limits specified when tested to ASTM D422 and ASTM C136/C136M : Sieve sizes to CAN/CGSB-8.1 .

.2 Table:

.1

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

.3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

.8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

.9 Contaminated Soil

.1 As defined in the Soil Characterization Report (WSP, 2024) and Section 01 35 43.01 – Environmental Protection Soil Management.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Quality Control: in accordance with Section 01 45 00 - Quality Control:

.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.

.2 Submit for review by DCC Representative proposed dewatering methods as described in PART 3 of this Section.

.3 Submit to DCC Representative written notice at least 7 calendar days prior to excavation work, to ensure cross sections are taken.

.4 Submit to DCC Representative written notice when bottom of excavation is reached.

.5 Submit to DCC Representative testing and inspection results as described in PART 3 of this Section.

.3 Preconstruction Submittals:

.1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.

.2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, and location plan of relocated and abandoned services, as required.

.4 Samples:

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

.2 Inform DCC Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

.1 Do not change source of Fly Ash without written approval of DCC Representative.

1.5 QUALITY ASSURANCE

.1 Submit design and supporting data at least 2 weeks prior to beginning Work.

.2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Ontario , Canada.

.3 Keep design and supporting data on site.

.4 Engage services of qualified professional Engineer who is licensed in Ontario , Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

.5 Do not use soil material until written report of soil test results are reviewed and approved by DCC Representative .

.6 Health and Safety Requirements:

.1 Do construction occupational health and safety in accordance with Section 01 70 12 - Safety Requirements .

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials in accordance with Section 01 74 00 - Cleaning and Waste Management .

1.7 EXISTING CONDITIONS

.1 Buried services:

.1 Before commencing work verify location of buried services on and adjacent to site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.

.3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.4 Before beginning excavation Work, notify applicable DCC Representative of the established location and state of use of buried utilities and structures. DCC Representative to clearly mark such locations to prevent disturbance during Work.

.5 Confirm locations of buried utilities by careful soil hydrovac methods .

.6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated .

.7 Where utility lines or structures exist in area of excavation, obtain direction of DCC Representative before removing or re-routing .

.8 Record location of maintained, re-routed and abandoned underground lines.

.9 Confirm locations of recent excavations adjacent to area of excavation.

.2 Existing buildings and surface features:

.1 Conduct, with DCC Representative , condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey benchmarks and monuments which may be affected by Work.

.2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by DCC Representative .

.3 Where required for excavation, cut roots or branches as directed by DCC Representative .

PART 2 PRODUCTS

2.1 MATERIALS

.1 All imported soils shall be in accordance with Division 01 35 43.01.

.2 Granular A material in accordance with OPSS.MUNI 1010.

.3 Granular B, Type II material in accordance with OPSS.MUNI 1010.

.4 Select Subgrade Material (SSM) in accordance with OPSS.MUNI 1010.

.5 Clay Liner (for Pond and Enhanced Grass Swales)

.1 Thickness as indicated

.2 Liquid Limit: greater or equal to 30

.3 Plastic Limit: greater or equal to 10

.4 Minimum hydraulic conductivity shall be 1 x 10^-6 cm/s (confirmed through lab testing paid for by contractor)

.6 Clear Stone, Type II material in accordance with OPSS.MUNI 1010.

.7 Rip-Rap, R-10 in accordance with OPSS.MUNI 1004.

.8 Geotextile material in accordance with Section 31 32 19.16 - Geotextile Soil Stabilization.

.9 Sand material: clean, washed, minimum 100% passing 4.75 mm sieve, maximum 5% passing 0.075 mm sieve in accordance with OPSS.MUNI 1010.

.10 Type 3 fill: selected material from excavation or other sources (Earth Borrow), approved by DCC Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials. Earth Borrow shall adhere to the approved and latest Soil Management Plan, as well as and applicable regulations and guidelines.

.11 Unsuitable Existing Fill (including debris):

.1 Existing fill as defined by the geotechnical report (WSP, 2024) shall be considered unsuitable for competent subgrade material for beneath buildings, roads, concrete apron and sidewalks, and other settlement sensitive facilities.

.2 Refer to Geotechnical Report, titled " Geotechnical Investigation, Proposed ME-46 Building, DCC Project No. HQ1076D1, CCN No. 7" prepared by WSP Canada Inc. dated February 7, 2024, and amended July 19, 2024.

.12 Contaminated Material:

.1 As defined in the Soil Characterization Report and Section 01 35 43.01 – Environmental Protection Soil Management.

.13 Unshrinkable fill: proportioned and mixed to provide:

.1 Maximum compressive strength of 0.4 MPa at 28 calendar days.

.2 Maximum cement content of 25 kg/m ^{3}with 40 % by volume fly ash replacement : to CSA-A3001 , Type GU.

.3 Minimum strength of 0.07 MPa at 24 h.

.4 Concrete aggregates: To CSA-A23.1/A23.2.

.5 Cement: Type GU.

.6 Slump: 160 to 200 mm.

PART 3 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to contract drawings and Section 01 35 43 - Environmental Procedures.

3.2 SITE PREPARATION

.1 Remove obstructions, ice, and snow from surfaces to be excavated within limits indicated.

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 PREPARATION/PROTECTION

.1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.

.2 Keep excavations clean, free of standing water and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

3.4 STRIPPING OF TOPSOIL

.1 Carry-out in accordance with Section 31 14 13 - Soil Stripping and Stockpiling.

3.5 STOCKPILING

.1 Carry-out in accordance with Section 31 14 13 - Soil Stripping and Stockpiling.

3.6 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Provide for DCC Representative's review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.

.1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dewater, divert, and dispose of water in accordance with Section 01 35 43 - Environmental Protections to approved receiver and in manner not detrimental to public and private property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

.6 Provide settling basins (as indicated), or other suitable treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

.7 Refer to Geotechnical Investigation Report (WSP, 2024), OPSS.MUNI 517, and Section 01 35 43 - Environmental Protections for additional dewatering considerations.

3.7 EXCAVATION

.1 Refer to Section 01 35 43.01 - Environmental Protection Soil Management for the requirements related to the handling, storing, transporting, and disposing of contaminated soils.

.2 Soil management shall be carried out in accordance with the approved and latest Soil Management Plan, as well as the following:

.1 O.Reg.153/04: Records of Site Condition - PART XV.1 of the Act

.2 O.Reg.406/19: On-Site and Excess Soil Management

.3 Perform trenching and excavation in work in accordance with the following:

.1 Occupational Health and Safety Act (OHSA)

.2 O. Reg. 213/91 – Construction Projects.

.3 OPSS.MUNI 401 and OPSS.MUNI 402

.4 Geotechnical Investigation Report (WSP, 2024)

.4 Excavate to lines, grades, elevations and dimensions indicated on the contract drawings, or as directed by DCC Representative.

.5 Remove concrete, masonry, paving, walks, demolished foundations and rubble, and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Site Demolition .

.6 Excavation must remain outside of any foundation 1H:1V bearing plane, not interfere with bearing capacity of adjacent foundations.

.7 Do not disturb soil within branch spread of trees or shrubs that are to remain.

.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.8 For trench excavation, unless otherwise authorized by DCC Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.9 Excavated and stockpiled materials to be kept at a safe distance as per Occupational Health and Safety Act.

.10 Restrict vehicle operations directly adjacent to open trenches.

.11 Dispose of surplus and unsuitable excavated material. Refer to Section 01 35 43.01 – Environmental Protection Soil Management for the requirements related to the handling, storing, transporting, and disposing of soils.

.12 Do not obstruct flow of surface drainage or natural watercourses.

.13 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.14 Notify DCC Representative when bottom of excavation is reached.

.15 Obtain DCC Representative approval of completed excavation.

.16 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by DCC Representative .

.17 Correct unauthorized over-excavation as follows:

.1 Fill under bearing surfaces and footings with Granular B - Type II compacted to not less than 100 % of corrected Standard Proctor maximum dry density.

.2 Fill under other areas with Select Subgrade Material (SSM) compacted to not less than 98 % of corrected Standard Proctor maximum dry density.

.18 Hand trim, make firm and remove loose material and debris from excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.19 Install geotextiles in accordance with Section 31 32 19.16 - Geotextile soil stabilization .

3.8 FILL TYPES AND COMPACTION

.1 Backfilling shall adhere to the Geotechnical Investigation Report (WSP, 2024) and as indicated in the contract drawings.

3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated.

.2 Place bedding and surround material in unfrozen condition.

3.10 CLAY LINER

.1 Install clay liner in locations and to depths indicated

.2 Lifts shall be uniform and should not exceed 150mm thickness

.3 Compacted lifts to 95% SPMDD (+/- 2% OMC) in accordance with OPSS.MUNI 501.

.4 Placement of clay liner shall not be undertaken when liner is subject to freezing temperatures.

.5 Placement of clay liner shall adhere to the Geotechnical Investigation Report (WSP, 2024)

3.11 RIP-RAP

.1 Place Rip-Rap as indicated, in accordance with OPSS.MUNI 511

3.12 BACKFILLING

.1 Do not proceed with backfilling operations until completion of the following:

.1 DCC Representative has inspected and approved installations.

.2 DCC Representative has inspected and approved of construction below finish grade.

.3 Inspection, testing, approval, and recording location of underground utilities.

.4 Removal of concrete formwork.

.5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.5 Backfilling around installations:

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

.3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 0.15 m.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from DCC Representative, or

.2 If approved by DCC Representative , erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by DCC Representative.

.6 Place unshrinkable fill in areas as indicated.

.7 Consolidate and level unshrinkable fill with internal vibrators.

3.13 RESTORATION

.1 Upon completion of Work, remove waste materials and debris in accordance with Section 01 74 00 - Cleaning and Waste Management, trim slopes, and correct defects as directed by DCC Representative.

.2 Replace topsoil as directed by DCC Representative.

.3 Reinstate lawns to elevation which existed before excavation.

.4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation in accordance with OPSS.MUNI 310 and 351, respectively.

.5 Clean and reinstate areas affected by Work as directed by DCC Representative .

.6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM A1064-10 (2013), Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.2 Ontario Provincial Standard Specifications (OPSS)/Ontario Ministry of Transportation:

.1 OPSS.MUNI 206 - April 2019, Construction Specification for Grading.

.2 OPSS.MUNI 351 - November 2021, Construction Specification for Concrete Sidewalk.

.3 OPSS.MUNI 353 - November 2021, Construction Specification for Concrete Curb and Gutter Systems.

.4 OPSS.MUNI 501 - November 2017, Construction Specification for Compacting.

.5 OPSS.MUNI 904 - November 2023, Construction Specification for Concrete Structures.

.6 OPSS.MUNI 1010 - November 2013, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

.7 OPSS.MUNI 1350 - November 2023, Material Specification for Concrete - Materials and Production.

1.2 PUBLICATIONS

.1 WSP Canada Inc.

.1 Geotechnical Report titled " Geotechnical Investigation, Proposed ME-46 Building, DCC Project No. HQ1076D1, CCN No. 7" prepared by WSP Canada Inc. dated May 2, 2024 and amended July 19, 2024.

.2 Soil Characterization Report titled "Soil Characterization Report, 19 Somme Avenue, Proposed Building ME-46, DDC, Project No. HQ1076D1, CCN No. 7, CFB Kingston" prepared by WSP Canada Inc. dated July 16, 2024.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit sampling and testing results as indicated in Subsection 3.8 - Sampling & Testing in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide Closeout Submittals in accordance with Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal: perform in accordance with Section 01 74 00 - Cleaning and Section 01 74 19 - Waste Management and Diversion.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Concrete Mixes and Materials: in accordance with OPSS.MUNI 1350.

.1 28-Day Compressive Strength: 32 MPa.

.2 Class C-2 Exposure.

.3 Nominal Maximum Aggregate: 19 mm.

.2 Curing Compound: in accordance with OPSS.MUNI 351 and OPSS.MUNI 353.

.3 Granular Base: Granular A material as per OPSS.MUNI 1010.

.4 Expansion Joint Material: in accordance with OPSS.MUNI 351 and OPSS.MUNI 353.

.5 Welded Wire Mesh: shall be 152 mm x 152 mm - MW18.7 x MW18.7 per ASTM A1064.

.6 Concrete Chairs (for Welded Wire Mesh): shall be 50 mm x 50 mm x 50 mm precast concrete, including embedded tie wire.

.7 Tactile Walking Surface Indicators: Cast iron in accordance with OPSS.MUNI 351. Dimensions in accordance with OPSD 310.039.

PART 3 EXECUTION

3.1 GRADE PREPARATION

.1 Do grade preparation work in accordance with the Grading Plan, OPSS.MUNI 351, and OPSS.MUNI 353.

3.2 GRANULAR BASE

.1 Remove any granular base material contaminated with frost-susceptible materials (including any topsoil, organics, or other soils). Contractor to supply, grade, and compact additional granular base material (as required) to lines, widths, and depths as indicated per OPSS.MUNI 351 and OPSS.MUNI 353.

.2 Compact granular base in maximum 150 mm layers to a minimum 100% of maximum density to OPSS.MUNI 206.

3.3 CONCRETE WORKS

.1 Obtain the DCC Representative's approval of granular base prior to placing concrete.

.2 Do concrete work in accordance with OPSS.MUNI 351 and OPSS.MUNI 353, and only during acceptable operational constraints (including temperature).

.3 Type and locations of concrete curbs, concrete sidewalks, and concrete patio as indicated.

.4 Immediately after floating, give the sidewalk and patio surfaces a uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing the broom in the direction normal to the center line.

.5 Provide edging as indicated with a 10 mm radius edging tool.

.6 Install joints:

.1 For curbs: in accordance with OPSS.MUNI 353

.2 For sidewalks: per OPSD 310.010 and OPSS.MUNI 351.

.3 For patios: as indicated.

.4 When the sidewalk is adjacent to the curb, make joints of curb, gutter, and sidewalk coincide.

.7 Where indicated, include welded wire mesh on concrete chairs.

3.4 TOLERANCES

.1 Finish surfaces to within 6 mm in 3 m as measured with a 3 m straightedge placed on surface.

3.5 TACTILE WALKING SURFACE INDICATORS

.1 Install tactile walking surface indicators at curb ramp edges, where indicated on drawings and in accordance with OPSS.MUNI 351.

3.6 CURING

.1 Concrete curing shall be according to OPSS.MUNI 351 and OPSS.MUNI 353.

.2 Apply the curing compound evenly to form a continuous film, in accordance with the manufacturer's requirement.

3.7 BACKFILL

.1 Allow the concrete to cure for 7 days prior to backfilling.

.2 Backfill to designated elevations with material as indicated on Drawings and Specifications.

.1 Compact and shape to required contours as indicated.

3.8 SAMPLING & TESTING

.1 Conduct tests as follows and in accordance with Section 01 45 00 - Quality Control.

.2 Granular Base - Compaction:

.1 Compacting testing shall be in accordance with OPSS.MUNI 501 (Method A).

.2 At a minimum:

.1 For Curbs: Compaction testing shall consist of one (1) field density and moisture measurement for every 10.0m increment of curb installed.

.2 For Sidewalk: Compaction testing shall consist of one (1) field density and moisture measurement for every 10.0m increment of sidewalk installed.

.3 For Patios: Compaction testing shall consist of one (1) field density and moisture measurement for every 100m2 area of concrete patio installed.

.3 Concrete - Sampling and Testing:

.1 Testing and reporting shall be in accordance with OPSS.MUNI 1350.

.2 At a minimum, one (1) set of Quality Assurance Tests, in accordance with OPSS.MUNI 1350 - Table 2, each day (for small pours of less than four (4) loads), or every fourth load (for larger pours).

3.9 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Section 01 74 19 - Waste Management and Diversion.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 - Excavation, Trenching and Backfilling

1.2 REFERENCE STANDARDS

.1 Department of Justice Canada (Jus):

.1 SOR/2018-196 Prohibition of Asbestos and Products Containing Asbestos Regulations

.2 American National Standards Institute/American Water Works Association (ANSI/AWWA):

.1 ANSI/AWWA B300-18, Standard for Hypochlorites

.2 ANSI/AWWA B301-18, Liquid Chlorine

.3 ANSI/AWWA B303-18, Sodium Chlorite

.4 ANSI/AWWA C219 - 2011, Bolted, Sleeve-Type Couplings For Plain-End

.5 ANSI/AWWA C153/A21.53-19, Standard for Ductile-Iron Compact Fittings

.6 ANSI/AWWA C502 - 2014, Dry-Barrel Fire Hydrants

.7 ANSI/AWWA C651- 2023, Disinfecting Water Mains

.8 ANSI/AWWA C655 - 2018, Field Dechlorination

.9 ANSI/AWWA C900-22, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 Inch through 12 Inch (100 mm - 300 mm), for Water Transmission and Distribution

.3 ASTM International (ASTM):

.1 ASTM B418-16a (2021), Standard Specification for Cast and Wrought Galvanic Zinc Anodes

.4 American Water Works Association (AWWA)/Manual of Practice:

.1 AWWA M17-2016, Installation, Field Testing, and Maintenance of Fire Hydrants

.5 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric

.3 CGSB 41-GP-25M-77, Pipe, Polyethylene, for the Transport of Liquids

.6 CSA Group (CSA):

.1 CSA-B137:23 Series, Thermoplastic Pressure Piping Compendium (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12)

.7 ULC Standards (ULC):

.1 CAN/ULC-S520:2022, Standard for Fire Hydrants

.2 CAN/ULC-S543-2023, Standard for Internal-Lug, Quick Connect Couplings for Fire Hose

.8 National Fire Protection Association (NFPA)

.1 NFPA 24 - 2016; Standard for the Installation of Private Fire Service Mains and Their
Appurtenances

.9 Ontario Provincial Standards Specifications (OPS)

.1 OPSS.MUNI 441- November 2021, Watermain Installation in Open Cut

.2 OPSS.MUNI 442- November 2020, Corrosion Protection of New and Existing Watermains.

.3 OPSS.MUNI 1350- November 2023, Concrete - Materials and Production

.10 Ministry of the Environment, Conservation, and Parks (MECP)

.1 2020 Watermain Disinfection Procedure

.2 F-6-1 - Procedures to Govern Separation of Sewers and Watermains

1.3 PUBLICATIONS

.1 Department of National Defence - Government of Canada

.1 Directorate of Architecture and Engineering Services (DAES) Technical Requirements - October 2021

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Schedule Work to minimize interruptions to existing services.

.1 Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by DCC Representative.

.2 Notify DCC Representative minimum of 24 hours in advance of interruption in service.

.3 Do not interrupt water service for more than 3 hours and confine this period between 10:00 and 16:00 hours local time unless otherwise authorized.

.4 Notify fire department of planned or accidental interruption of water supply to hydrants.

.5 Provide and post "Out of Service" sign on hydrant not in use.

.6 Advise local police department of anticipated interference with movement of traffic.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, product literature and data sheets for distribution piping materials and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Pipe certification to be on pipe.

.3 Shop Drawings:

.1 Submit complete drawings and construction schedule for water mains 100 mm diameter and larger. Include method for installation of water main.

.4 Samples:

.1 Inform DCC Representative of proposed source of bedding materials and provide access for sampling at least 4 weeks before commencing work.

.2 Submit manufacturer's test data and certification that pipe materials meet requirements of this section 4 weeks minimum before beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.

.5 Installation, Testing, Disinfection, Sampling and Commissioning Plan:

.1 The Contractor shall submit a detailed waterworks installation and commissioning plan to the DCC Representative for review and approval. The plan shall detail the type, make, and location of all proposed fittings, restraints, and associated appurtenances. The plan shall also detail the proposed disinfection procedures, sequencing, and duration of work required for the new watermain. The disinfection procedure shall follow the requirements of:

.1 OPSS.MUNI 441

.2 MECP - 2020 Watermain disinfection procedure

.3 AWWA Standards (C651-14 and C655-18)

.4 City of Kingston Municipal Standards and Procedures.

.5 NFPA 13 - Sprinklers (for minimum hydrostatic test pressure)

1.6 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: Submit operation and maintenance data for pipe, valves, valve boxes, valve chambers and hydrants for incorporation into manual.

.3 Submit data to support as-built drawing development, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details.

.1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, and hydrants.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 - Common Product Requirements.

.2 Packaging Waste Management: Perform in accordance with Section 01 74 11 - Cleaning and Waste Management.

1.8 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

PART 2 PRODUCTS

2.1 PIPE, JOINTS, AND FITTINGS

.1 Polyvinyl chloride pressure pipe: to ANSI/AWWA C900, pressure class 235, DR 18, 1 MPa gasket bell end.

.2 Flexible elastomeric seals for bell and spigot joints shall be according to ASTM D3139.

.3 The pipe shall be homogeneous throughout, free from voids, cracks, inclusions, discolouration, and other defects.

.4 All pipe and fittings shall be certified by CSA to meet CSA B137.3

.5 Fittings shall be:

.1 Ductile iron according to AWWA C153/A21.53 or

.2 Injection moulded PVC plastic according to CSA B137.2 or

.3 Prefabricated PVC plastic for pipe diameters 300mm and larger according to CSA B137.3

.6 The colour for all PVC pipe and PVC fittings shall be blue

2.2 PIPE PROTECTION

.1 Tracer wire on mains shall be protected with a 2.3 kg zinc anode, at each end a maximum spacing of which shall be 500 m.

.2 Anodes shall be exothermic welding to valves, metallic fittings and hydrants and shall be 10.9 kg zinc casting alloy conforming to ASTM B418-16a (2021) or 14.5 kg magnesium extrusion conforming to ASTM B-843-93.

.3 One (1), five and a half (5.5) kilogram Zinc anode shall be installed with each service Anodes shall be installed with each service (as per Kingston Municipal Standards).

.4 Provide cathodic protection in accordance with OPSS.MUNI 442 and OPSD 1109.011.

2.3 VALVES AND VALVE BOXES

.1 Valve boxes shall be of cast iron 112mm and shall be of sliding type, complete with grommeted hole for tracer wire, which cannot carry any surface load down to the pipe, in accordance with City of Kingston Municipal Standards. The covers shall be of a design which prevents unauthorized entry and marked “Water”, length to be 140mm to 240mm. Special attention shall be paid to compaction adjacent to valve boxes.

.2 Gate Valves for pipe shall be cast iron body, resilient seated mechanical joint pattern conforming to ANSI/AWWA C509 and OPSS.MUNI 441, designed for a working pressure of not less than 200 PSI. Valves shall open when turned in a counterclockwise direction, and shall be fitted with 2 inch square operating nut. All valves shall be manufacturer approved for direct bury applications.

.3 Top of box to be marked "WATER"/"EAU".

2.4 PIPE BEDDING AND SURROUND MATERIAL

.1 Type 3 in accordance with Section 31 23 33.01 - Excavation, Trenching and Backfilling.

2.5 BACKFILL MATERIAL

.1 Granular A in accordance with Section 31 23 33.01 - Excavation, Trenching and Backfilling.

2.6 PIPE DISINFECTION

.1 Disinfecting solution in accordance with the approved Installation, Testing, Disinfection, Sampling and Commissioning Plan.

2.7 INSULATION

.1 The insulation material shall be extruded polystyrene according to OPSS.MUNI 1605 with a minimum compressive strength of 275 kPa.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Verify that conditions of substrates previously installed under other Sections or Contracts are acceptable for distribution piping installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrates in presence of DCC Representative.

.2 Inform DCC 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 DCC Representative.

3.2 PREPARATION

.1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.

.1 Inspect materials for defects to approval of DCC Representative.

.2 Remove defective materials from site as directed by DCC Representative.

3.3 TRENCHING

.1 Do trenching work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Prepare trench to depth, profile, and alignment, as indicated in the contract drawings.

3.4 GRANULAR BEDDING

.1 Place granular bedding material as indicated.

.2 Do not place material in frozen condition.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to 95 % maximum density to OPSS.MUNI 501.

.6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling with compacted bedding material.

3.5 PIPE INSTALLATION

.1 Lay piping in accordance with OPSS.MUNI 441.

.2 Terminate building water service 1.5 m outside building wall opposite point of connection to main.

.1 Install coupling necessary for connection to building plumbing.

.2 If plumbing is already installed, make connection; otherwise cap or seal end of pipe and place temporary marker to locate pipe end.

.3 Bevel or taper ends of PVC pipe to match fittings.

.4 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.

.5 Lay pipes on prepared bed, true to line and grade.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.2 Take up and replace defective pipe.

.3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.

.6 Face socket ends of pipe in direction of laying. For mains on grade of 2 % or greater, face socket ends up-grade.

.7 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.

.8 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.

.1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.9 Position and join pipes with equipment and methods approved by DCC Representative.

.10 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.11 Align pipes before jointing.

.12 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.13 Avoid displacing gasket or contaminating with dirt or other foreign material.

.1 Remove disturbed or contaminated gaskets.

.2 Clean, lubricate and replace before jointing is attempted again.

.14 Complete each joint before laying next length of pipe.

.15 Minimize deflection after joint has been made.

.16 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.17 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by DCC Representative.

.18 Restrain all bends, tees, and dead ends by means of mechanical joint and thrust blocks.

.19 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.

.20 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.

.21 Do not lay pipe on frozen bedding.

.22 Do hydrostatic (at 200 PSI) and leakage test in accordance with approved Installation, Testing, Disinfection, Sampling and Commissioning Plan.

.23 Backfill remainder of trench.

.24 Install insulation in areas of reduced cover, as indicated

3.6 VALVE INSTALLATION

.1 Install valves to manufacturer's recommendations at locations as indicated, and in accordance with OPSS.MUNI 441.

.2 Support valves located in valve boxes or valve chambers by means of Bedding same as adjacent pipe. Valves not to be supported by pipe.

3.7 RESTRAINED JOINTS

.1 All connections, caps, and bends shall be mechanically restrained.

.2 All mechanical restraints and couplers shall have a safety factor of 2 above standard host pipe pressure rating and shall be compatible with host pipe. Use only restrained joint products approved by DCC Representative.

.3 For in-line pipe connections only: in accordance with AWWA C219-11.

.4 The minimum restraint length (in both directions) from a bend or tee shall be 12m.

3.8 HYDROSTATIC AND LEAKAGE TESTING

.1 Complete hydrostatic and leakage testing in accordance with the approved Installation, Testing, Disinfection, Sampling and Commissioning Plan. Contractor shall be responsible for all associated for the initial, as well as any retesting which may be required.

.2 In the event of a failed test, the Contractor is responsible for costs associated with investigating and remediating any issues with the newly installed system.

.3 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.

.4 Notify DCC Representative at least 3 calendar days in advance of proposed tests.

.1 Perform tests in presence of DCC Representative.

.5 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by DCC Representative.

.6 Upon completion of pipe laying and after DCC Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed as directed by DCC Representative.

.7 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.

.8 Open valves.

.9 Expel air from main by slowly filling main with potable water.

.10 Thoroughly examine exposed parts and correct for leakage as necessary.

.11 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.

.12 Repeat hydrostatic test until defects have been corrected.

.13 Locate and repair defects if leakage is greater than amount specified.

.14 Repeat test until leakage is within specified allowance for full length of water main.

3.9 PIPE SURROUND

.1 Upon completion of pipe laying and after DCC Representative has inspected Work in place, surround and cover pipes as indicated.

.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.3 Place layers uniformly and simultaneously on each side of pipe.

.4 Do not place material in frozen condition.

.5 Compact each layer from pipe invert to mid height of pipe to at least 95% of corrected maximum dry density per OPSS.MUNI 501.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 95% of corrected maximum dry density per OPSS.MUNI 501.

3.10 BACKFILL

.1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.2 Do not place backfill in frozen condition.

.3 Under paving and walks, compact backfill to at least 95% of corrected maximum dry density per OPSS.MUNI 501.

3.11 HYDRANT FLOW TESTS

.1 Contractor to retain a qualified to conduct flow tests on every hydrant in accordance with NFPA 291 (2022) and provide written report to DCC Representative.

3.12 FLUSHING AND DISINFECTING

.1 Flushing and disinfecting in accordance with the approved Installation, Testing, Disinfection, Sampling and Commissioning Plan.

.1 Notify DCC Representative at least 4 calendar days in advance of proposed date when disinfecting operations will begin.

.2 Provide connections and pumps for flushing as required.

.3 All chlorine residual sampling, and bacteriological sampling, shall be carried out by a qualified Certified Operator or a Water Quality Analyst (licensed in the Province of Ontario) retained by the Contractor.

3.13 SURFACE RESTORATION

.1 After installing and backfilling over water mains, restore surface to original condition as directed by DCC Representative.

END OF SECTION