

PROJECT NO. R.046094

BID DOCUMENTS AND SPECIFICATIONS

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GARAGE REPAIRS

VERSION: ISSUED FOR TENDER

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PART 1 GENERAL

1.1 TAXES

- .1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal).

1.2 FEES, PERMITS AND CERTIFICATES

- .1 Pay all fees and obtain all permits.
- .2 Provide authorities with plans and information for acceptance certificates.
- .3 Obtain inspection certificates as evidence that work conforms to requirements of Authority Having Jurisdiction.

1.3 CONSTRUCTION PROGRESS SCHEDULE

- .1 Schedule and execute work with least possible interference or disturbance to the normal use of premises.
- .2 On award of contract submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion. When the Departmental Representative has reviewed schedule, take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative.
- .3 Meetings:
 - .1 Attend ad-hock site meetings throughout the progress of work with Departmental Representatives at a mutually agreeable time for the discussion of progress of the work and to resolve any difficulties.
 - .2 Representatives of the Contractor, Subcontractor and suppliers attending the meetings will be qualified and authorized to act on behalf of party each represents.
 - .3 At least one week prior to start of work, attend a pre-construction meeting between the Departmental Representatives and the Contractor's Project Manager and site superintendent/foreman to discuss the work.

1.4 REGULATORY REQUIREMENTS

- .1 References and Codes:
 - .1 Materials shall be new and work shall conform to the minimum applicable standards of the "References" indicated in the specification sections, the National Building Code of Canada 2015 (NBC) and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirement shall apply.
- .2 Building Smoking Environment:
 - .1 Comply with smoking restrictions. Smoking is not permitted anywhere within the building or at entrances to the building.

1.5 FIRE SAFETY REQUIREMENTS

- .1 Comply with both the National Building Code of Canada 2015 and the National Fire Code of Canada 2015 for safety of persons in buildings in the event of a fire and the protection of buildings from the effects of fire, as follows;

- .1 The National Building Code of Canada (NBC): for fire safety and fire protection features that are required to be incorporated in a building during construction.
- .2 The National Fire Code of Canada 2015 (NFC):
 - .1 The on-going maintenance and use of the fire safety and fire protection features incorporated in buildings.
 - .2 The conduct of activities that might cause fire hazards in and around buildings.
 - .3 Limitations on hazardous contents in and around buildings.
 - .4 The establishment of fire safety plans.
 - .5 Fire safety at construction and demolition sites.
- .2 Welding and cutting:
 - .1 Before welding, soldering, grinding and/or cutting work, obtain a permit as directed by the Departmental Representative. Store flammable liquids in approved CSA containers.
 - .2 At least one week prior to commencing cutting, welding or soldering procedure, provide to Departmental Representative:
 - 1. Notice of intent, indicating devices affected, time and duration of isolation or bypass.
 - .1 Completed welding permit as defined in NFC.
 - .2 Return welding permit to Departmental Representative immediately upon completion of procedures for which permit was issued.
 - .3 "Fire Watchers" as described in NFC shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 15m may be ignited by conduction or radiation.
- .3 Where work requires interruption or cause activation of fire alarms or fire suppression, extinguishing or protection systems:
 - .1 Provide "Watchman Service" as described in NFC; In general, watchman service is defined as an individual conversant with "Fire Emergency Procedures", performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.
 - .2 Retain services of manufacturer for fire protection systems on daily basis or as approved by Departmental Representative, to isolate and protect all devices relating to:
 - 1. Modification of fire alarms, fire suppression, extinguishing or protection systems; and/or
 - 2. Cutting, welding, soldering or other construction activities that might activate fire protection systems.
 - .3 Immediately upon completion of work, restore fire protection systems to normal operation and verify that all devices are fully operational.
 - .4 Inform fire alarm system monitoring agency and local Fire Department immediately prior to isolation and immediately upon restoration of normal operation.

1.6 HAZARDOUS MATERIALS

- .1 Hazardous Materials: product, substance, or organism that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.

- .2 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Material Safety Data Sheets (MSDS).
- .3 For work in occupied buildings, give the Department Representative one week notice for work involving designated substances (Ontario Bill 208), hazardous substances (Canada Labour Code Part II Section 10), and before painting, caulking, installing carpet or using adhesives and other materials, that cause off gassing.

1.7 EXAMINATION AND PREPARATION

- .1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.
- .2 Before commencing work, establish location and extent of services lines in area of work and notify Departmental Representative of findings.
- .3 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
 - .1 Arrange to shut off affected utilities with utility companies.
 - .2 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
 - .3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- .4 Verify existing conditions on the site and dimensions shown on the drawings and report any errors or inconsistencies to the Departmental Representative before commencing the Work. Note all irregularities affecting the Work.
- .5 Do not use water to control dust when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding or pollution.
- .6 Be responsible for damage caused or clean-up required by dispersion of dust generated by the work.

1.8 EXECUTION

- .1 Cut, Patch and Make Good:
 - .1 Cut existing surfaces as required to accommodate new work.
 - .2 Remove items so shown or specified.
 - .3 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.
- .2 Sleeves, Hangers and Inserts: co-ordinate setting and packing of sleeves and supply and installation of hangers and inserts. Obtain Departmental Representative's approval before cutting into structure.
- .3 Unless otherwise specified, materials for removal become the Contractor's property. Take removed materials from site.

1.9 SECURITY CHECK

- .1 All personnel employed on this project will be subject to security check. Obtain requisite clearance, as instructed, for each individual required to enter the premises.
- .2 Personnel will be checked daily at start of work shift and given a pass, which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

1.10 COST BREAKDOWN

- .1 Before submitting first progress claim, submit breakdown of Contract Amount in detail as directed by Departmental Representative and aggregating the Contract Amount. After approval by Departmental Representative cost breakdown will be used as the basis of progress payments.

PART 2 PRODUCTS

2.1 NOT USED.

- .1 Not used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not used

END OF SECTION 01 00 10

PART 1 GENERAL

1.1 USE OF SITE AND FACILITIES.

- .1 Execute work with least possible interference or disturbance to the normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for occupant, visitor and vehicle access.

1.2 SPECIAL SCHEDULING REQUIREMENTS.

- .1 Carry out work during "off hours", Monday to Friday from 16:00 to 06:00 hours, and all-day on Saturdays, Sundays, and statutory holidays.
- .2 Provide seventy-two (72) hours written notice to Departmental Representative for work required to be performed outside the designated times. Do not proceed without written approval of Departmental Representative.
- .3 Perform work so as to minimize disruptions to building operation and services. Advise Departmental Representative seventy-two (72) hours in advance of proposed shutdowns of any services. Do not proceed without written approval of Departmental Representative.
- .4 Advise Departmental Representative seventy-two (72) hours in advance of any work that reduces building security. Do not proceed without written approval of Departmental Representative.

1.3 PHASING.

- .1 Perform work in phases in order to maintain a minimum of one lane open at the drive lane. Where two-way traffic is required through a single drive lane, provide traffic control measures (I.E. traffic lights, flagmen mirrors, signage, other) to ensure smooth traffic flow. Ensure any traffic lights are calibrated to prioritize heavy-flow directions as they fluctuate through the day (I.E. prioritize traffic entering the garage in the mornings and exiting the garage in the afternoons).
- .2 Phase work as required to prioritize local concrete repairs in drive aisle where temporary shoring is currently installed. Coordinate removal of existing temporary shoring work with the current rental contractor.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used

END OF SECTION 01 14 00

PART 1 GENERAL

1.1 REFERENCES

- .1 Federal Legislation
 - .1 Canada Labour Code, Part II, section 124 and 125.
 - .1 Canada Occupational Health and Safety Regulations
 - .2 Transportation of Dangerous Goods Act, 1992 (TDGA)
 - .3 PSPC Asbestos Management Standard
 - .4 Canada Consumer Product Safety Act
 - .1 Surface Coating Materials Regulations SOR/2016-193.
 - .5 Canadian Environmental Protection Act, 1999 (CEPA)
 - .1 PCB Regulations (SOR/2008-273)
 - .2 Federal Halocarbon Regulations, 2003 (SOR/2003-289)
- .2 Provincial Legislation
 - .1 Ontario Occupational Health and Safety Act, R.S.O. 1990.
 - .1 Ontario Regulation 490/09 – Designated Substances (O.Reg. 490/09).
 - .2 Ontario Regulation 278/05 – Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations (O.Reg. 278/05).
 - .3 Ontario Regulation 213/91 for Construction Projects (O.Reg. 213/91)
- .3 Ontario Environmental Protection Act, R.R.O. 1990.
 - .1 Ontario Regulation 347/90, General – Waste Management (O.Reg. 347/90).
 - .2 Ontario Regulation 463/10, Ozone Depleting Substances and Other Halocarbons (O.Reg. 463/10).
 - .3 Ontario Dangerous Goods Transportation Act.
- .4 Canadian General Standards Board (CGSB).
- .5 Canadian Standards Association (CSA International). Selection, Use, and Care of Respirators
- .6 Underwriters' Laboratories of Canada (ULC).

1.2 DEFINITIONS

- .1 Asbestos-Containing Materials (ACMs): means material that contains 0.5 per cent or more asbestos by dry weight as per Ontario Regulation 278/05.
- .2 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.
- .3 Time-weighted average exposure limit (TWAEEL): the time-weighted average airborne concentration of a biological or chemical agent to which a worker may be exposed in a work day or work week as prescribed by Ontario Regulation 490/09 Designated Substances, as amended.

1.3 DESIGNATED SUBSTANCES

- .1 Confirm with the Departmental Representative that no additional designated substances have been brought to the project area prior to beginning work.
- .2 Additional designated substances and hazardous materials may exist outside the accessible survey areas but are beyond the scope of this project.
- .3 Should any additional material, suspected to be a designated substance, be encountered within the project area, any disturbance of such material must be stopped, precautionary measures taken, and the Departmental Representative must be notified immediately. Do not proceed until written instructions have been received.
 - .1 ACRYLONITRILE: Not Identified
 - .2 ARSENIC: Not Identified
 - .3 ASBESTOS: Identified
 - .1 Based on recent sampling, expansion joint glue observed in the P1 parking garage was found to be asbestos containing.
 - .4 BENZENE: Not Identified
 - .5 COKE OVEN EMISSIONS: Not identified
 - .6 ETHYLENE OXIDE: Not Identified
 - .7 ISOCYANATES: Not Identified
 - .8 LEAD: Assumed
 - .1 Based on recent sampling water proof surface coating observed on the floors throughout the parking garage was found to be non-lead containing.
 - .2 Lead is assumed to be present in:
 - .1 Solder on the joints of copper piping; and
 - .2 Joint packings of drainpipes.
 - .9 MERCURY: Identified
 - .1 Mercury is present within the fluorescent light tubes in the project area. Fluorescent light tubes are not expected to be impacted by the project.
 - .10 SILICA: Identified
 - .1 Silica is present in the concrete, cement compound, parging cement compound, and cement within the project area.
 - .11 VINYL CHLORIDE MONOMER: Not Identified
 - .12 POLYCHLORINATED BIPHENYLS (PCBs): **Assumed**
 - .1 During the site investigation, fluorescent light fixtures were observed in the project areas. The ballasts associated with these light fixtures are suspected to contain PCBs, unless proven otherwise. PCB's are not anticipated to be impacted by the project.

1.4 RECOMMENDATIONS

.1 ASBESTOS

- .1 Refer to the following sections for abatement precaution specifications;
 - .1 02 82 00.01 Asbestos Minimum Precautions
 - .2 02 82 00.02 Asbestos Intermediate Precautions
 - .3 02 82 00.03 Asbestos Maximum Precautions
- .2 All work must be done in accordance with Canada Occupational Health and Safety Regulations (as amended), PSPC Asbestos Management Standard, and O.Reg 278/05 (as amended). In the event of conflict between the federal and provincial regulations, the most stringent procedures apply.
- .3 The disturbance of ACMs on construction and demolition projects by the *Canada Occupational Health and Safety Regulations*, *PSPC Asbestos Management Standard*, and in the province of Ontario by *O.Reg 278/05*, as amended. These Regulations classifies all asbestos disturbances as Low Risk (Type 1), Moderate Risk (Type 2), or High Risk (Type 3), each of which has defined precautionary measures. All asbestos materials are subject to specific handling and disposal precautions, and must be removed prior to demolition. The Ontario Ministry of Labour (MoL) must be notified of any project involving removal of more than a minor amount (e.g. typically 1 square metre) of friable asbestos material.
- .4 Disposal of asbestos waste must be done in accordance with "General – Waste Management" O.Reg. 347/90 (as amended) under the Ontario Environmental Protection Act, the Ontario Dangerous Goods Transportation Act, and the federal Transportation of Dangerous Goods Act. The waste must be disposed at a licensed waste disposal site. Proper notification must be issued to the Departmental Representative prior to transportation of waste.

.2 LEAD

- .1 Follow recommendations provided in the Ontario Ministry of Labour (MoL) Guideline entitled "Guideline: Lead on Construction Projects". This guideline classifies all lead disturbances as Type 1, Type 2a, Type 2b, Type 3a or Type 3b work, and assigns different levels of respiratory protection and work procedures for each classification.
- .2 Work procedures and personal protective equipment must be used to ensure that workers are not exposed to airborne lead levels that exceed the TWAEL of 0.05 milligram per cubic metre (mg/m³) prescribed by *O.Reg. 490/09*.
- .3 Disposal of construction waste containing lead must be done in accordance with O.Reg. 347/90 – General Waste Management, as amended, under the Ontario Environmental Protection Act, the Ontario Dangerous Goods Transportation Act, and the federal Transportation of Dangerous Goods Act. The classification of the waste is dependent upon the result(s) of leachate test(s). The waste can be classified as "hazardous", "non-hazardous" or "registerable solid waste" depending on the results of the leachate test.

.3 SILICA

- .1 Comply with *Ontario Regulations O.Reg. 490/09* when performing work that may disturb silica-containing materials.
- .2 Silica dust can be generated through such processes as sanding, blasting, grinding, crushing, and sandblasting silica-containing material. Since silica is present in select materials within the project area, appropriate respiratory protection and ventilation must be used during work.
- .3 Follow recommendations provided in the MoL Guideline entitled "Guideline: Silica on Construction Projects". This document classifies all silica disturbances as Type 1, Type 2 or Type 3 work, and assigns different levels of respiratory protection and work procedures for each classification. These work procedures should be followed when performing work involving the disturbance of silica-containing materials.

PART 2 PRODUCTS

.1 Not used

PART 3 EXECUTION

.1 Not used

END OF SECTION 01 14 25

PART 1 GENERAL

1.1 GENERAL

- .1 Submit promptly to Departmental Representative submittals listed for review, in orderly sequence to not cause delay in work.
- .2 Allow up to 10 working days for Departmental Representative to review all submittals. Submittals must be delivered to the Departmental Representative to allow sufficient time for material ordering and delivery.
- .3 Do not proceed with work affected by submittals until review is complete.
- .4 Provide inspection certificates as evidence that work conforms to requirements of Authority Having Jurisdiction.
- .5 Submittals: Refer to section 01 35 29.06 for Health and Safety specific submittals in addition to the following;
 - .1 Notice of Project filed with the Ministry of Labour as required by the Occupational Health and Safety Act
 - .2 Names of project superintendent and site foreman
 - .3 Project schedule with details of each aspect of the work
 - .1 Obtain Departmental Representative's approval of Project Schedule before proceeding with the work on site.
 - .4 Building Permit

1.2 SHOP DRAWINGS

- .1 Submit five (5) copies of shop drawings: bearing stamp and signature of qualified Professional Engineer registered or licensed in Province of Ontario.
- .2 The review is for the sole purpose of ascertaining conformance with the general design concept, and does not mean approval of the design details inherent in the shop drawings, responsibility for which shall remain with the Contractor. Such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents.
- .3 Review of shop drawings does not imply any change in any other professionals' responsibilities related to design of specific items as outlined by the specifications.
- .4 Allow a minimum of 10 working days for review of each submission of shop drawings in Departmental Representative's office. Allow more time when large quantities of shop drawings are submitted. Submit in general conformity with the sequence of construction intended.
- .5 After review, the drawings will be stamped and returned. Do not commence fabrication until returned shop drawings have been examined.
- .6 Shop drawings marked "**REVIEWED**" can be used for fabrication. Do not make any changes or additions to these drawings without notifying the Departmental Representative.

- .7 Shop drawings marked **“REVIEWED AS NOTED”** can be used for fabrication after the revisions noted are implemented. Do not make any further changes or additions to these drawings without notifying the Departmental Representative.
- .8 Shop drawings marked **“REVISE AND RESUBMIT”** require substantial revisions and must be resubmitted for additional review prior to fabrication. All changes and additions to the previous submission to be clearly identified on the resubmitted drawings. Only the identified changes will be reviewed on re-submission.
- .9 Shop drawings marked **“REVIEWED FOR IMPACT ON BASE STRUCTURE ONLY”** show works which are not within the scope of structural consulting services but affect behaviour of the base structure. Departmental Representative will not review design of these works and assumes that the indicated weights and all other loads imposed on the base structure are correctly identified by the designer / supplier of these elements.
- .10 Drawings marked **“NOT REVIEWED”** show works which are not within the scope of structural consulting services and do not impact the base building structure.
- .11 The Departmental Representative will not review design and implementation of any temporary works, nor assess impact of these works on the base structure. The contractor and / or the professional engineer engaged by the contractor must ensure that the base structure is not adversely affected by the temporary works and construction process and that temporary loads do not exceed the design loads indicated on drawings.
- .12 Do not use shop drawings as a means to propose substitutions or alternatives to the materials, products or details indicated in contract documents. Such shop drawings will be marked “revise and resubmit”.
- .13 Provide final record drawings after all corrections are made.

1.3 PRODUCT DATA

- .1 Submit five (5) copies of product data: manufacturers catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.
- .2 Cross reference product data information to applicable portions on Contract Documents.

1.4 SAMPLES

- .1 Submit for review samples in triplicate: examples of materials, equipment, quality, finishes and workmanship.
- .2 Where colour, pattern or texture is criterion, submit full range of samples.
- .3 Reviewed and accepted samples will become standard of material and workmanship, against which installed work will be verified.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

3.1 NOT USED

 .1 Not Used

END OF SECTION 01 33 00

PART 1 GENERAL

1.1 GENERAL

- .1 Provide temporary protection, heat and ventilation to facilitate progress of work, to provide a safe working environment and to protect work and materials from cold/heat and moisture during all phases of the work. Do not use direct-fired heaters discharging into work areas unless approved by the Departmental Representative.
- .2 Arrange and pay for the services of a Professional Engineer, licenced in Ontario to design and review the installation of temporary shoring.

1.2 ADDITIONAL PROTECTION REQUIREMENTS

- .1 Protect existing mechanical, electrical, telephone and similar services from damage. Have utility companies locate all services prior to working in the area, define protection they require and obtain their acceptance of current status of service. Before commencing work in a protected area, test protection to ensure adequacy.
- .2 Prior to commencement of work, verify the condition of all grates, catch basins, drains, pipes, etc. that will be affected by the work. Disconnect, protect and seal all drains, as listed above, to prevent entry of debris.
- .3 During work, ensure that utility companies review and provide written acceptance of contractor procedures and conditions of their services during the work and before they are re-covered. Have utilities provide written verification of satisfactory inspection of their services.
- .4 Prior to beginning any concrete removals, meet with the Departmental Representative's electrician and/or representative to identify and map-out all known main electrical conduits or other systems embedded in the slab and to identify all services mounted to the soffits of all slabs within the work areas. The Contractor shall confirm in writing that this has been completed.
- .5 Where necessary to complete the work, remove existing electrical fixtures and provide temporary lighting as required. Re-install fixtures following the repair. Remove and /or protect all services as required to complete the work.
- .6 Concrete repairs are expected to generate dust that contains silica as well as presenting a risk of exposure to Designated Substances. The Contractor shall take adequate precautions to contain dust, to collect and dispose of dust in a safe manner, and to provide protection to persons exposed to the dust and other designated substances in accordance with Section 01 14 25. This shall include compliance with:
 - .1 Ontario Health and Safety Guidelines for "Silica on Construction Projects" April 2011
 - .2 Regulation for Construction Projects, Ont. Reg. 213/91
 - .3 WHMIS Regulation R.R.O 1990, Reg.860
- .7 Advise Departmental Representative of any procedures that may cause fire alarms to activate.
- .8 Arrange and pay for fire protection systems bypass as required in the work area. Refer to division 21 and mechanical drawings.

PART 2 PRODUCTS

.1 Not Used.

PART 3 EXECUTION

.1 Not Used.

End of Section 01 35 13.01

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 00 10 General Instructions

1.2 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Ontario
 - .1 Occupational Health and Safety Act and Regulations for Construction projects, R.S.O 1990, c.0.1, as amended;
 - .2 and O. Reg. 213/91 as amended – Updated 2005.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operations.
- .3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports weekly to Departmental Representative
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS – Material Safety Data Sheets
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 2 days after receipt of comments from Departmental Representative
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.4 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award.
- .3 Work zone locations include:

.1 Parking Garage

- .4 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

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

1.7 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with Section 01 00 10, clause 1.4 – Regulatory Requirements.

1.8 GENERAL REQUIREMENTS

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

1.9 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.10 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.

1.11 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.12 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with the proposed work.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

1.13 POSTING OF DOCUMENTS

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

1.14 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.15 BLASTING

- .1 Not Applicable

1.16 POWDER ACTUATED DEVICES

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

1.17 WORK STOPPAGE

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

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION 01 35 29.06

PART 1 GENERAL

1.1 GENERAL

- .1 Provide qualified site superintendent/foreman who will oversee all work carried out at the site. Site superintendent/Foreman to be familiar with the requirements of the specifications, and present at all times that work is being carried out, including Subcontractor activities.
- .2 Monitor compliance with the project schedule on an ongoing basis.

1.2 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Notify the Departmental Representative, inspection and testing agents not less than 48 hours prior to each part of work being ready for review or testing. Work which requires review or testing shall not be performed on weekends or holidays unless previously agreed upon.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Be responsible for payment of costs if the work is not ready when stated and if the Departmental Representative and inspection and testing agency are not given sufficient notice of such delay.
- .5 Departmental Representative reserves the right to deduct from the Contractor amounts for extra inspection and testing by the Departmental Representative as required for certification of payment of work done to repair a deficiency.
- .6 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to the Departmental Representative. Pay costs for retesting and reinspection.

1.3 TESTING LABORATORY SERVICES

- .1 Departmental Representative will appoint and pay for costs of inspection and testing services, unless indicated otherwise.
- .2 Provide safe working areas and assist with testing procedures, including provisions for materials or services and co-ordination, as required by testing agency and as authorized by Departmental Representative.
- .3 Where tests indicate non-compliance with specifications, pay for initial test and all subsequent testing of work to verify acceptability of corrected work.

1.4 REPORTS

- .1 Submit copies of inspection and test reports to Departmental Representative.

1.5 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used

END OF SECTION 01 45 00

PART 1 GENERAL

1.1 GENERAL

- .1 Existing services required for work may be used without charge. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expense and responsibility.
- .2 Provide temporary utilities controls to execute work expeditiously. Remove from site all such work after use.
- .3 Notify the Departmental Representative and utility companies of intended interruption of services and obtain requisite permission.
- .4 Give the Departmental Representative one week notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. Keep duration of these interruptions to a minimum. Carry out all interruptions after normal working hours of the occupants, preferably on weekends.
- .5 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and pedestrian and vehicular traffic and/or building occupants.
- .6 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

1.2 TEMPORARY VENTILATION

- .1 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .1 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .2 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .3 Ventilate storage spaces containing hazardous or volatile materials.
 - .4 Ventilate temporary sanitary facilities.
 - .5 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .2 Maintain strict supervision of operation of temporary ventilating equipment to Conform with applicable codes and standards.
 - .1 Enforce safe practices.
 - .2 Prevent abuse of services.
 - .3 Prevent damage to finishes.
 - .4 Vent direct-fired combustion units to outside.
 - .5 Be responsible for damage to Work due to failure in providing adequate protection during construction.

1.3 TEMPORARY POWER AND LIGHT

- .1 Electricity from existing electrical outlets may be used for temporary electrical power for hand held equipment free of charge. Arrange and pay for any usage and connection costs required for all other equipment. Do not connect to the building's power supply without written permission of Departmental Representative.
- .2 Provide and maintain temporary lighting throughout project. Ensure level of illumination in accordance with local by-laws and buildings codes.

1.4 WATER SUPPLY

- .1 The existing water supply from existing hose bibs at the site may be used free of charge. Any water required in excess of this supply shall be metered and paid for by the Contractor. Be responsible for connecting to the existing services. Do not use fire system without written permission of the Departmental Representative

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used

END OF SECTION 01 51 00

PART 1 GENERAL

1.1 ACCESS SCAFFOLD

- .1 Scaffolding: in accordance with CSA Z797[-09] – Code of Practice for Access Scaffold.
- .2 Provide design drawings, signed and sealed by qualified Professional Engineer licensed in the province of Ontario, where prescribed.
- .3 Additions or modifications to scaffolding must be approved by Professional Engineer in writing.

1.2 LOADING BAYS AND ELEVATORS

- .1 Loading Bays and Freight Elevators may be used by construction personnel and for transporting of materials.
 - .1 Co-ordinate with Departmental Representative.
 - .2 Protect from damage, safety hazards and overloading of existing equipment.

1.3 SITE STORAGE

- .1 Equip and maintain the storage space assigned by Departmental Representative.
- .2 Do not unreasonably encumber site with materials or equipment.
- .3 Move stored products or equipment that interfere with operations of Departmental Representative or other contractors.
- .4 Obtain and pay for use of additional storage or work areas needed for operations.
- .5 Do not load or permit to load any part of work with weight or force that will endanger work.

1.4 OFFICE

- .1 Maintain at the job site one copy, including all amendments, of each of the following:
 - .1 Contract drawings and specifications
 - .1 Site Visit Reports issued by Departmental Representative
 - .2 Contemplated Change Orders and Change Orders
 - .3 Material Test Reports
 - .4 Accurate daily records of all work performed, weather and labour force
 - .5 Manufacturer's written instructions for all products to be used
 - .6 Proof of all applicable training and WHMIS certifications for all site personnel
 - .7 Product data sheets to meet the WHMIS and MSDS requirements
 - .8 Provincial Occupational Health and Safety Act and Site Specific Safety Plan
 - .9 Shoring Design

- .10 Any other document indicated in the site specific health and safety plan as required by Section 01 35 29.06

1.5 CONSTRUCTION PARKING

- .1 Parking of personal vehicles in the work area is not permitted.

1.6 SANITARY FACILITIES

- .1 Provide temporary sanitary facilities and maintain in a sanitary condition in accordance with governing regulations and ordinances. Site facilities shall not be used by the Contractor's forces, unless approved by the Departmental Representative.

1.7 SIGNAGE

- .1 Provide common-use signs related to traffic control, information, instruction, use of equipment, public safety devices, etcetera, in both official languages with equal prominence or by the use of commonly understood graphic symbols and to approval of the Departmental Representative.
- .2 No advertising will be permitted on this project.
- .3 Maintain approved signs and notices in good condition for duration of project and dispose of off site, on completion of project or earlier, as directed by Departmental Representative.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used

END OF SECTION 01 52 00

PART 1 GENERAL

1.1 GENERAL

- .1 Maintain existing services to building and provide for occupant, visitor and vehicle access.

1.2 HOARDING

- .1 Design, erect and maintain temporary site enclosure and covered pedestrian walkways and drive lane. Provide protection, complete with signs and electrical lighting as required by authority having jurisdiction.

1.3 DUST CONTROL

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

1.4 PUBLIC TRAFFIC FLOW

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
- .2 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to preform work and protect public.
- .3 Maintain and relocate protection until such work is complete.

1.5 FIRE ROUTES

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.
- .2 If emergency routes may be impeded by construction, advise Departmental Representative immediately, coordinate with local emergency services and receive approval prior to proceeding with work.

1.6 PROTECTION

- .1 Protect work against damage until take-over.
- .2 Protect adjacent work against the spread of dust and dirt beyond the work areas.
- .3 Protect operatives and other users of site from all hazards.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

- 3.1 NOT USED
- .1 Not Used

END OF SECTION 01 56 00

PART 1 GENERAL

1.1 QUALITY OF WORK

- .1 Carry out work using qualified licensed workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.
- .2 Permit employees registered in Provincial apprenticeship program to perform specific tasks only if under direct supervision of qualified licensed workers.
- .3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.
- .4 Immediately notify the Departmental Representative if required Work is such as to make it impractical to produce required results.

1.2 QUALITY OF PRODUCT

- .1 Non-specified and defective materials shall not be brought to site. Remove any non-specified materials from site within 24 hours upon request by the Departmental Representative. Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .2 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout construction.

1.3 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove packaging or bundling until required in work.
- .3 Be responsible for the security of all materials and equipment. Make no claims for theft or damage to the Departmental Representative.

1.4 MANUFACTURER'S WRITTEN INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify the Departmental Representative in writing, of conflicts, such as material incompatibility, between specifications and manufacturer's written instructions, so that Departmental Representative can establish the required course of action.

- .3 All work shall meet or exceed the more stringent of the manufacturer's written instructions or the requirements of this Specification.
- .4 Improper installation of products, due to failure in complying with these requirements, authorizes the Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used

END OF SECTION 01 61 00

PART 1 GENERAL

1.1 GENRAL

- .1 Clean up as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
- .2 Use only cleaning materials per the manufacturer's written instructions of surface to be cleaned, and as recommended by cleaning material manufacturer's written instructions.
- .3 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .4 For work requiring interior building access, ensure no combustible materials (e.g. cardboard, wood, plastic, other debris) are placed or stored in elevator shafts, ventilation shafts or means of egress including hallways, stairwells, and fire escapes.

1.2 FINAL CLEANING

- .1 Upon completion remove scaffolding, temporary protection and surplus materials. Make good defects noted at this stage.
- .2 Flush clear all drains affected by the work. Assume all responsibility for any damage resulting from the use of the building's drainage system to dispose of construction water irrespective of the drain system condition.
- .3 Clean areas under contract to a condition equal to what previously existed and to approval of Departmental Representative.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used

END OF SECTION 01 74 00

PART 1 GENERAL

1.1 GENERAL

- .1 Comply with Environmental Protection Act, Ontario Regulations: O. Reg. 102/94 – Waste Audits and Waste Reduction Work Plans; and O. Reg. 103/94 – Industrial, Commercial and Institutional Source Separation Programs; for waste management on construction and demolition projects.
- .2 Supply a disposal bin for temporary storage of debris at locations authorized by Departmental Representative. Do not locate bins on a structural slab or provide temporary support as required. Remove disposal bins promptly when full and upon completion of the work.
- .3 Conduct "waste audit" to determine what waste will be generated during construction and demolition operations. Prepare written "waste reduction work plan" and implement the principles to reduce, reuse and recycle materials to the extent that is possible.
- .4 Provide a "source separation program" to disassemble and collect in an orderly fashion the following "materials designated for alternative disposal" from the "general waste" stream:
 - .1 brick and Portland cement concrete;
 - .2 cardboard (corrugated);
 - .3 gypsum board (unfinished);
 - .4 steel; and
 - .5 wood (not including painted, treated or laminated wood).
- .5 Submit complete records of all removals from site for both "materials designated for alternative disposal" and "general waste" including:
 - .1 time and date of removal;
 - .2 description of material and quantities; and
 - .3 proof that materials have been received at an approved Waste Processing Site or certified Waste Disposal Site as required.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used

END OF SECTION 01 74 19

PART 1 GENERAL

1.1 GENERAL

- .1 Attend a final walk-through with Departmental Representative and Departmental Representative. Departmental Representative will record identified, defects and incomplete work on a punch list.
- .2 Make good all known deficiencies to conform to contract documents
- .3 Notify Departmental Representative of readiness for final inspection only after completion of these items.

1.2 OPERATIONAL AND MAINTENANCE MANUALS

- .1 Submit to Departmental Representative six (6) copies of approved Operations Data and Maintenance Manual in both official languages, compiled as follows:
 - .1 Bind data in vinyl hard cover 3 "D" ring type loose-leaf binders for 212 x 275 mm size paper. Binders must not exceed 75mm thick or be more than 2/3 full.
 - .2 Enclose title sheet labelled "Operation Data and Maintenance Manual," project name, date and list of contents. Project name must appear on binder face and spine.
 - .3 Organize contents into applicable sections of work to parallel project specifications breakdown. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.
- .2 Include following information plus data specified:
 - .1 Maintenance instruction for finished surface and materials.
 - .2 Copy of hardware and paint schedules.
 - .3 Description: operation of the equipment and systems defining start-up, shut-down and emergency procedures, and any fixed or adjustable set points that affect the efficiency of the operation. Include nameplate information such as make, size, capacity and serial number.
 - .4 Maintenance: use clear drawings, diagrams or manufacturers' literature which specifically apply and detail the following:
 - .1 lubrication products and schedules;
 - .2 trouble shooting procedures;
 - .3 adjustment techniques; and
 - .4 operational checks.
 - .5 Suppliers' names, addresses and telephone numbers and components supplied by them must be included in this section. Components must be identified by a description and manufacturers part number.
 - .1 Guarantees showing:
 - .1 name and address of projects;
 - .2 guarantee commencement date (date of Interim Certificate of Completion);
 - .3 duration of guarantee;

- .4 clear indication of what is being guaranteed and what remedial action will be taken under guarantee; and
 - .5 signature and seal of Guarantor.
 - .2 Additional material used in project listed under various Sections showing name of manufacturer and source of supply.
- .3 Spare parts: list all recommended spares to be maintained on site to ensure optimum efficiency. List all special tools appropriate to unique application. All parts/tools detailed must be identified as to manufacturer, manufacturer part number and supplier (including address).
- .4 Include one complete set of final shop drawings (bound separately) indicating corrections and changes made during fabrication and installation.

1.3 RECORDS

- .1 As work progresses, maintain accurate records to show deviations from contract drawings. Just prior to Departmental Representative's inspection for issuance of final certificate of completion, supply to the Departmental Representative one (1) set of white prints with all deviations neatly inked in. The Departmental Representative will provide two sets of clean white prints for this purpose.
- .2 Provide copies of "as-built" drawings illustrating all repair locations. "As built" drawings to correspond to National CADD Standard including layering convention."

1.4 GUARANTEES AND WARRANTIES

- .1 Before completion of work collect all manufacturer's guarantees or warranties and deposit with Departmental Representative.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used

END OF SECTION 01 78 00

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This Section specifies work required for selective concrete removal of existing conventionally reinforced concrete structures for the purpose of repairs.

1.2 RELATED REQUIREMENTS

- .1 Section 03 01 37 – Concrete Restoration

1.3 REFERENCE STANDARDS

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

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit demolition, shoring, and bracing shop drawings:
 - .1 Provide shoring and bracing drawings for removals as required by technical sections herein and as otherwise necessary to complete the work. Provide drawings prepared by a professional engineer licenced in Ontario, Canada.
 - .2 Shoring Engineer to confirm that floors supporting shoring will not be overloaded.
 - .3 Shoring drawings submitted must show design criteria including:
 - .1 Loads and forces accounted for in the design;
 - .2 Removal limits on concrete slabs, columns and walls;
 - .3 Procedural sequence to be followed for shoring installation; and
 - .4 Header and sill plates at each post shore or tower shore support.
- .3 Provide shoring installation review letter from shoring design engineer confirming they visited site and verified installation conforms to respective shop drawings prior to demolition.

1.5 SITE CONDITIONS

- .1 Notify Departmental Representative before disrupting access or services.

1.6 INSPECTIONS AND TESTING

- .1 Provide Departmental Representative minimum 48 hours notice for review of the following milestones:
 - .1 All identified delaminated concrete;
 - .2 Completed removals within designated areas; and

- .3 Completed surface preparation.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MACHINERY

- .1 For topside removals:
 - .1 Surface concrete to depth of embedded steel: maximum 14kg pneumatic Hammers.
 - .2 Concrete at and beyond embedded steel: maximum 7kg pneumatic hammers.

PART 3 EXECUTION

3.1 GENERAL

- .1 Delineate and mark delaminated areas on the concrete surface using hammer sounding techniques and/or by chain dragging. Mark other areas including areas that have already delaminated or spalled, scaled surfaces, exposed reinforcement, and any other conditions requiring repair. Mark limits with a straight-line using lumber crayon or spray paint.
- .2 Obtain Departmental Representative's approval prior to removing concrete.
- .3 As concrete removal progresses, extensions to the above marked areas may be necessary. Obtain Departmental Representative's approval of these additional areas before proceeding with removal.
- .4 Departmental Representative may require that sound concrete also be removed in the vicinity of the approved repair areas. This may be required to minimize the number of small patches or to eliminate areas of unrepaired concrete projecting into patches or to investigate the condition of the steel.

3.2 CONCEALED CONDUIT

- .1 Scan slab for locations of electrical and communications services contained within the slab prior to commencing with removals.
- .2 Damage to conduits to be reported immediately to Departmental Representative.

3.3 EXPOSED CONDUIT

- .1 Mechanically unfasten surface mounted conduit from the concrete surface to facilitate repairs. Fully protect conduit during Work and reinstate on completion.
- .2 Replace and make fully operational all exposed electrical conduits damaged during the execution of the work with surface mounted electrical conduit.
- .3 Mechanically unfasten surface mounted high voltage electrical conduit at affected locations and fully protected from the concrete removal. Re-secure conduit once concrete repairs have been completed.

3.4 SHORING

- .1 Install shoring in accordance with engineered drawings.
- .2 Maintain shoring and formwork until repair concrete has attained 75% of the specified 28-day strength, unless otherwise specified by the Shoring Engineer.

3.5 DELAMINATED CONCRETE REMOVAL

- .1 Use removal methods to minimize damage to sound concrete which remains. Take measures to prevent damage to reinforcing steel, drains, mechanical, and electrical services.
- .2 Remove concrete in the repair area until sound concrete is reached or to a minimum depth of 30mm below the reinforcing steel. Do not remove concrete beyond this limit except where authorized by Departmental Representative.
- .3 Extend removals along reinforcing bars to the point where 100mm of the exposed bars are free of corrosion.
- .4 Upon completion of initial removals, sound the concrete surface immediately surrounding the repair area for local delamination. Review additional delaminated areas with Departmental Representative and remove as directed.
- .5 Sawcut patch perimeter to provide a vertical surface. Do not cut into steel reinforcement.
- .6 At intersections with columns and walls, extend removals 25mm into vertical element.

END OF SECTION 02 41 16.01

PART 1 GENERAL

1.1 SUMMARY

- .1 Comply with requirements of this Section when performing the following work:
 - .1 Disturbance of non-friable asbestos-containing material, if the material is removed without being broken, cut, drilled, abraded, ground, sanded or vibrated.
 - .2 Disturbance of non-friable asbestos-containing materials 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 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 – Intermediate Precautions
- .3 Section 02 82 00.03 – Asbestos Abatement – Maximum Precautions

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 Material Safety Data Sheets (MSDS).
- .4 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .5 Ontario Environmental Protection Act, R.R.O 1990,
 - .1 General – Waste Management, O. Reg. 347/90, as amended.
- .6 Underwriters' Laboratories of Canada (ULC).
- .7 National Joint Council (NJC).
 - .1 Part XI – Hazardous Substances.
- .8 Canada Labour Code Part II, section 124 and 125.
 - .1 Canada Occupational Health and Safety Regulations
- .9 PSPC Asbestos Management Standard
- .10 Ontario Ministry of Labour (MoL).

- .2 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 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 DOP Test: testing method used to determine integrity of unit using Dispersed Oil Particulate (DOP) HEPA-filter leak test.
- .8 Friable material means material that:
 - .1 When dry, can be crumbled, pulverized or powdered by hand pressure, or 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 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
- .11 Occupied Area: any area of the building or work site that is outside Asbestos Work Area.
- .12 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.
- .13 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 proof of Contractor's Asbestos Liability Insurance.
- .4 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.
- .5 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.
- .6 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.
- .7 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:
 - .1 Safety Requirements: worker protection.
 - .2 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 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 (Tyvek or similar, 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 an asbestos waste container.
- .4 Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.
- .5 Ensure workers wash hands and face when leaving Asbestos Work Area.
- .6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

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. 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 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in asbestos Waste Containers, as per paragraph 2.1.3.
- .7 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 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.

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 asbestos 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.

- .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 Cutting, shaping, grinding, drilling, abrading or otherwise disturbing non-friable asbestos-containing materials shall be executed using non-powered hand-tools only.
- .5 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 Canada.
- .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 02 82 00.01

PART 1 GENERAL

1.1 SUMMARY

- .1 Comply with the requirements (as a minimum) of this Section when performing the following Work:
 - .1 Disturbance of non-friable asbestos containing material using non-powered hand-held tools or power tools equipped with a dust collecting device with HEPA filters.
- .2 Refer to the Specification Section 01 14 25 – Designated Substance Report for details on asbestos-containing materials.

1.2 RELATED REQUIREMENTS

- .1 Section 01 14 25 – Designated Substance Report
- .2 Section 02 82 00.01 – Asbestos Abatement: Minimum Precautions
- .3 Section 02 82 00.03 – Asbestos Abatement: Maximum Precautions

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 Material Safety Data Sheets (MSDS).
- .4 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .5 Ontario Dangerous Goods Transportation Act
- .6 Ontario Environmental Protection Act, R.R.O 1990,
 - .1 General – Waste Management, O. Reg 347/90, as amended.
- .7 Underwriters' Laboratories of Canada (ULC).
- .8 National Joint Council (NJC).
 - .1 Part XI – Hazardous Substances.
- .9 PSPC Asbestos Management Standard
 - .1 Canada Labour Code Part II
 - .2 Canada Occupational Health and Safety Regulations

- .1 Ontario Ministry of Labour (MoL).
 - .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 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 Glove Bag: prefabricated glove bag as follows:
 - .1 Minimum thickness 0.25 mm (10 mil) polyvinyl-chloride bag.
 - .2 Integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elastic ports.
 - .3 Equipped with reversible, double-pull, double throw zipper on top and at approximately mid-section of the bag.
 - .4 Straps for sealing ends around pipe.
 - .5 Must incorporate internal closure strip if it is to be moved or used in more than one specific location.
- .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 filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.
- .12 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
- .13 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.
- .14 Occupied Area: any area of building or work site that is outside Asbestos Work Area.
- .15 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 proof of Contractor's Asbestos Liability Insurance.
- .4 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.
- .5 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.
- .6 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.
- .7 Submit Worker's Compensation Board status and transcription of insurance.
- .8 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
 - .1 encapsulants;
 - .2 amended water;
 - .3 slow-drying sealer.

- .9 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.
- .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 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.
 - .2 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 (Tyvek or similar, 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.
- .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 licensed landfill for burial.

1.8 EXISTING CONDITIONS

- .1 Refer to the Specification Section 01 14 25 – Designated Substance Report 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.

1.10 PERSONNEL TRAINING

- .1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, at minimum:
 - .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 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 Glove bag:
 - .1 Acceptable materials: safe-T-Strip products in configuration suitable for Work, or Alternative material approved by addendum during tendering period in accordance with Instructions to Tenderers.
 - .2 The glove bag to be equipped with:
 - .1 Sleeves and gloves that are permanently sealed to the body of the bag to allow the worker to access and deal with the insulation and maintain a sealed enclosure throughout the work period.
 - .2 Valves or openings to allow insertion of a vacuum hose and the nozzle of a water sprayer while maintaining the seal to the pipe, duct or similar structure.
 - .3 A tool pouch with a drain.
 - .4 A seamless bottom and a means of sealing off the lower portion of the bag.

- .5 A high strength double throw zipper and removable straps, if the bag is to be moved during the removal operation.
- .5 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.
- .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.
- .1 Sealer: flame spread and smoke developed rating less than 50 and be compatible with new fireproofing.
- .7 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 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: 'CAUTION ASBESTOS HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)'.
- .2 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.
- .3 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 Type 2 work areas, shut off mechanical ventilation system serving work area, and seal ventilation ducts to and from work area. Abatement work areas shall be separated from other areas using visual barriers that prevent members of the public from viewing abatement work operations.
- .4 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.
 - .1 Use garden reservoir type low - velocity sprayer or airless spray equipment capable of producing mist or fine spray.
 - .2 Perform Work in a manner to reduce dust creation to lowest levels practicable.

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- .5 Pipe Insulation Removal Using Glove Bag:
- .1 Place tools necessary to remove insulation in tool pouch. Wrap bag around pipe and close zippers. Seal bag to pipe with cloth straps.
 - .2 Place hands in gloves and use necessary tools to remove insulation. Arrange insulation in bag to obtain full capacity of bag.
 - .3 Insert nozzle of garden reservoir type sprayer into bag through valve and wash down pipe and interior of bag thoroughly. Wet surface of insulation in lower section of bag.
 - .4 When glove bags are intended for use at more than one location: after wash-down and application of sealer, seal off waste in lower section of bag using zipper at mid-section of bag. Remove air from top section of bag through elasticized valve using HEPA vacuum. Remove bag from pipe, reinstall in new location, and reseal to pipe prior to opening lower section of bag. Repeat stripping operation.
 - .5 If bag is to be moved along pipe, first remove air from top section through elasticized valve using HEPA vacuum. Next loosen straps, move bag, re-seal to pipe using double-pull zipper to pass hangers. Repeat stripping operation.
 - .6 To remove bag after completion of stripping, wash top section and tools thoroughly. Remove air from top section through elasticized valve using a HEPA vacuum. Pull polyethylene waste container over glove bag before removing from pipe. Release one strap and remove freshly washed tools. Place tools in water. Remove second strap and zipper. Fold over into waste container and seal.
 - .7 After removal of bag ensure that pipe is free of residue. Remove residue using HEPA vacuum or wet cloths. Ensure that surfaces are free of sludge which after drying could release asbestos dust into atmosphere. Seal exposed surfaces of pipe and ends of insulation with slow-drying sealer to seal in any residual fibres.
 - .8 Upon completion of Work shift, cover exposed ends of remaining pipe insulation with polyethylene taped in place.
- .6 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.
- .7 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 will 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 industry standard practice.
- .3 If air monitoring shows that areas outside the work area or in the clean room area are contaminated, 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.
- .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.

END OF SECTION 02 82 00.02

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 any non-friable asbestos containing material if the work is done by means of power tools that are not attached to dust-collecting devices equipped with HEPA filters.
- .2 Refer to the Specification Section 01 14 25 – Designated Substances for details on asbestos-containing material.

1.2 RELATED SECTIONS

- .1 Section 01 14 25 – Designated Substances
- .2 Section 02 82 00.01 – Asbestos Abatement: Minimum Precautions
- .3 Section 02 82 00.02 – Asbestos Abatement: Intermediate Precautions

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 PSPC Asbestos Management Standard
- .4 Department of Justice Canada.
 - .1 Canadian Environmental Protection Act (CEPA), 1999.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .6 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .7 Ontario Dangerous Goods Transportation Act
- .8 Ontario Environmental Protection Act, R.R.O 1990,
 - .1 General – Waste Management, O. Reg 347/90, as amended.
- .9 Underwriters' Laboratories of Canada (ULC).
 - .1 Canada Labour Code Part II, Section 124 and 125.
 - .2 Canada Occupational Health and Safety Regulations
- .10 National Joint Council (NJC).
 - .1 Part XI – Hazardous Substances.
- .11 PSPC Asbestos Management Standard

.12 Ontario Ministry of Labour (MoL).

.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

.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

.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 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.

.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 Obtain from appropriate agency and submit to Departmental Representative necessary permits for transportation and disposal of asbestos waste. Ensure that dump operator is fully aware of hazardous nature of material being dumped, and proper methods of disposal. Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to receive and properly dispose of asbestos waste.
 - .2 Submit proof satisfactory to Departmental Representative that every worker involved in a Type 3 operation has successfully completed the Asbestos Abatement Worker Training Program approved by the Ministry of Training, Colleges and Universities and every supervisor of a worker involved in a Type 3 operation has successfully completed the Asbestos Abatement Supervisor Training Program approved by the Ministry of Training, Colleges and Universities as outlined in O. Reg. 278/05, s. 20 (1). Submit proof of attendance in form of certificate.
 - .3 Submit proof satisfactory to Departmental Representative that every worker who will be entering a Type 3 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 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 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 proof of Contractor's Asbestos Liability Insurance.
 - .9 Submit Worker's Compensation Board status and transcription of insurance.

- .10 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including but not limited to following:
 - a) amended water;
 - b) slow-drying sealer.
- .11 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. Comply with regulations in effect at time work is performed.
- .2 Health and Safety:
 - .1 Safety Requirements: worker and visitor protection.
 - .2 Protective equipment and clothing to be worn by workers while in Asbestos Work Area includes:
 - .1 As a minimum, full-face 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 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 (Tyvek or similar, 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 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 worksuits 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.
- .4 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
- .5 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual asbestos abatement.
- .6 Provide and post in Clean Change Room and in Equipment and Access Room the procedures described in this Section, in both official languages.
- .7 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.
- .8 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 ml 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) days before beginning Work on this Project notify following in writing:
 - .1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.
 - .1 Regional Office of Labour Canada.
 - .2 Provincial/Territorial, Department of Labour.
 - .3 Disposal Authority.
- .2 Inform sub-trades of presence of asbestos-containing materials identified in the Specification Section 01 14 25 – Designated Substance Report.
- .3 Submit to Departmental Representative copy of notifications prior to start of Work.
- .4 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 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 respirators includes, at minimum:
 - .1 Proper fitting of equipment.
 - .2 Inspection and maintenance of equipment.

- .3 Cleaning and Disinfecting of equipment.
- .4 Limitations of equipment.
- .3 Instruction and training must be provided by competent, qualified person.
- .4 Every worker involved in a Type 3 operation must have successfully completed the Asbestos Abatement Worker Training Program approved by the Ministry of Training, Colleges and Universities.
- .5 Every supervisor of a worker involved in a Type 3 operation must have successfully completed the Asbestos Abatement Supervisor Training Program approved by the Ministry of Training, Colleges and Universities.

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 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.
- .7 Scaffolding: Of appropriate size and strength to accommodate project in accordance with O.Reg 213/91, with specifications and set-up to be approved and stamped by professional engineer. Include in contract sum costs due to this requirement.
- .8 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.
- .9 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 within one (1) month 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: "CAUTION ASBESTOS HAZARD AREA (25 mm) NO UNAUTHORIZED ENTRY (19 mm) WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)".
- .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 reworn 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. 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 waste water 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 waste water 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 waste water.
 - .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 additional 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 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 will 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 industry standard practice.
- .3 If air monitoring shows that areas outside the work area or in the clean room area are contaminated, 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.
- .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 02 82 00.03

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This Section specifies work required for selective concrete replacement of existing conventionally reinforced concrete structures for the purpose of repairs.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 16.01 – Structure Demolition-Concrete Removal.

1.3 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA)
 - 1. CSA-A23.1: Concrete Materials and Methods of Concrete Construction.
 - 2. CSA A23.2: Methods of Test for Concrete.
 - 3. CSA A283: Qualification Code for Concrete Testing Laboratories.
 - 4. CSA A3000: Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - 5. CSA G30.18: Billet Steel Bars for Concrete Reinforcement
 - 6. CSA S448.1: Repair of Reinforced Concrete in Buildings and Parking Structures.
 - 7. CSA W186-M1990: Welding of Reinforcing Bars in Reinforced Concrete Construction
- .2 American Society for Testing and Materials (ASTM)
 - 1. B418 – Standard Specification for Cast and Wrought Galvanic Anodes
 - 2. C260/C260M-10a(2016) – Standard Specification for Air-Entraining Admixtures for Concrete
 - 3. C494/494M-05a – Standard Specification for Chemical Admixtures for Concrete
 - 4. C1116/C1116M-10a(2015) – Standard Specification for Fiber-Reinforced Concrete
- .3 American Concrete Institute (ACI):
 - 1. 562 – Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Buildings and Commentary
- .4 International Concrete Repair Institute (ICRI):
 - 1. ICRI Concrete Repair Terminology.
- .5 The Society for Protective Coatings (SSPC) et la National Association of Corrosion Engineers (NACE) International:
 - 1. NACE No. 4/SSPC-SP 7 – Brush-Off Blasting.

1.4 SUBMITTALS

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

- .2 Provide a concrete mix design and certification that mix proportions selected will produce concrete of quality, yield, and strength as specified in concrete mixes, and will comply with CSA-A23.1.
- .3 Submit formwork design, signed and sealed by a Professional Engineer licenced in Ontario Canada, to support all expected loads and forces.
- .4 Product data sheets

1.5 QUALITY ASSURANCE

- .1 Products shall be installed in accordance with the Manufacturer's written directions.

1.6 AMBIENT CONDITIONS

- .1 Air and surface temperatures during application and curing of reinforcing steel epoxy and manufacturer approved touch-up coatings as per manufacturer written recommendations.
- .2 For concrete placement, take the necessary precautions whenever the air temperature falls below +5°C or exceeds +27°C. Make preparations in advance of placing concrete and place concrete in accordance with the hot and cold weather requirements included in CSA A23.3. Do not place concrete or mortars whose temperature falls below +10°C or exceeds +30°C. Do not place concrete or mortars in the rain. Provide temporary equipment for heating as required.

1.7 INSPECTION AND TESTING

- .1 Notify Departmental Representative for field review of the following:
 - .1 Completion of surface preparation;
 - .2 Final review of preparation of reinforcing steel and epoxy coating; and
 - .3 Review of placement of concrete, including application of slurry coat or bonding agent.
- .2 Conform to CSA Standard A23.2.
- .3 Concrete testing: Concrete testing for ready-mixed and site mixed concrete shall be by an independent agency and is to include:
 - .1 Concrete sampling to be done in accordance with CSA A23.2-1C;
 - .2 Frequency of concrete sampling to be done in accordance with CSA A23.1;
 - .3 Compressive strength tests to be completed in accordance with CSA A23.2-9C; and
 - .4 Curing and making cylinders on site to be done in accordance with CSA A23.2-3C.
- .4 Compressive strength testing: Each strength test sample will consist of three cylinders with proper identification and field data. One specimen will be tested at 7 days and two at 28 days. Store cylinders in the field for a minimum of 24h prior to transporting to the testing laboratory.

- .5 If concrete is being placed when there is a probability of the air temperature falling below 5°C during the curing period, each test shall include one additional “field-cured” cylinder to be stored as near to the placed concrete as possible. The extra cylinder shall receive the same protection from the elements as the concrete that they represent. The extra cylinder shall be stored in the field for the full 5-day cure period prior to being transported to the testing laboratory for a 7-day compressive strength test.
- .6 Temperature of the fresh concrete shall be measured in accordance with CSA A23.2-17C.
- .7 Slump Testing: One standard slump (or slump flow) test with each standard strength test in accordance with CSA A23.2-5C.
- .8 Air Content Testing: The determination of the air content on fresh concrete to be performed in accordance with CSA A23.2-7C. An air content test is to be performed on each truck until the results are consistently compliant
- .9 Concrete testing for Pre-Bagged Concrete:
 - .1 Concrete sampling to be done in accordance with CSA A23.2-1C;
 - .2 Frequency of concrete sampling to be done in accordance with CSA A23.1;
 - .3 Compressive strength tests to be completed in accordance with CSA A23.2-9C; and
 - .4 Curing and making cylinders on site to be done in accordance with CSA A23.2-3C.
- .10 Compressive strength testing: Each strength test sample will consist of three cylinders with proper identification and field data. One specimen will be tested at 7 days and two at 28 days. Store cylinders in the field for a minimum of 24h prior to transporting to the testing laboratory.
- .11 If concrete is being placed when there is a probability of the air temperature falling below 5°C during the curing period, each test shall include one additional “field-cured” cylinder to be stored as near to the placed concrete as possible. The extra cylinder shall receive the same protection from the elements as the concrete that they represent. The extra cylinder shall be stored in the field for the full 5-day cure period prior to being transported to the testing laboratory for a 7-day compressive strength test. Temperature of the fresh concrete shall be measured in accordance with CSA A23.2-17C.
- .12 Slump Testing: One standard slump (or slump flow) test with each standard strength test in accordance with CSA A23.2-5C.
- .13 Concrete may be rejected prior to placement if:
 - .1 Concrete fails to conform to specified mix design.
 - .2 Concrete placement does not begin within 1-1/2 hours from batch time where set retarding admixtures are not employed or the concrete is older than 2 hours from batch time.
 - .3 Where set retarding admixtures are employed, concrete placement extends beyond maximum placement/working times stipulated by the supplier on the mix design submission.
- .14 Concrete will be considered under strength if:

- .1 The average of any day's compressive strength tests of each class of concrete is below specified strength.
- .2 Any single compressive strength test result is more than 3.5 MPa below specified strength.
- .3 In case of dispute, and at the discretion of Departmental Representative, Contractor may have three 100mm DIA. cores from the concrete drilled and tested at Contractor's own expense for each result below the required strength, in accordance with CSA Standard A23.2-04C. The results shall be evaluated in accordance with CSA Standard A23.1.
- .15 Bond Tests: Bond testing to be completed to CSA A23.2-6B.
 - .1 Departmental Representative may request tensile capacity tests perpendicular to the plane of the interface between the patch material and the parent material. Average bond strength shall exceed 1.5 MPa (220 psi). Any patch with a bond test result less than 1.0 MPa shall be rejected.
 - .2 Further testing, subsequent to any failure shall be paid for by the Contractor.
 - .3 .Departmental Representative may require additional testing as deemed necessary.

1.8 ORIGINAL DESIGN LIVE LOADS

- .1 Refer to drawings for original design loads,

PART 2 PRODUCTS

2.1 CAST-IN-PLACE CONCRETE - GENERAL

- .1 Concrete supplier to assume responsibility for concrete mix proportions
- .2 Normal Portland cement, Type GU to CSA A3001, unless modified herein.
- .3 Water: Potable
- .4 Aggregate: To conform CSA A23.1.
- .5 Fibre reinforcing: Polypropylene fibres to ASTM C1116, Type III.
- .6 Air-entraining agents: To ASTM C260/C260M-10a(2016).
- .7 Water reducing agents: To ASTM C494/C494M-05a.
- .8 Superplasticizers: To ASTM C494/C494M-05a, Types A & F.
- .9 Set retarding admixtures: To ASTM C494/C494M-05a, Types B & D.

2.2 READY-MIX CONCRETE

- .1 Through slab repairs at ledge beams: Exposure Class C-1, 20mm aggregate, 35 MPa.
- .2 Top surface repairs at column exploratory openings: Exposure Class C-1, 10mm aggregate, 35 MPa.
- .3 Concrete Topping: Exposure Class C-1, 10mm aggregate, 35 MPa.

2.3 PRE-BAGGED CONCRETE REPAIR PRODUCTS

- .1 Pre-bagged concrete repair products may be used for small repair areas where approved by the Departmental Representative.
- .2 Product shall meet the requirements of CSA A23.1
 - .1 Class of exposure: C-1
 - .2 Compressive strength: 35 MPa minimum.
 - .3 Air content: To CSA A23.1-14
 - .4 Nominal maximum size of coarse aggregate: 10mm. Use pre-extended repair products only.
 - .5 Water: Potable water, volume as per product manufacturer's technical datasheet

2.4 NON-SHRINK GROUT

- .1 Product shall meet the requirements of CSA A23.1
- .2 Compressive strength: 40 MPa minimum.

2.5 REINFORCING STEEL

- .1 Billet steel, grade 400 weldable, deformed bars to CSA G30.18.
- .2 All new steel shall be black steel

2.6 FIELD APPLIED EPOXY COATING FOR EXISTING BLACK REINFORCING STEEL

- .1 Two component epoxy, high solids with the following properties:
 - .1 MPI: #108
 - .2 VOC range: Less than 221 g/L, class E3 to MPI #108
 - .3 Volume solids: 80±5%

2.7 DOWEL ADHESIVE

- .1 Epoxy adhesive for setting of dowels in conformance with CSA A23.3-14.

2.8 BONDING AGENT

- .1 Use bonding agent on existing concrete surfaces in contact with new concrete
- .2 For cast-in place concrete use cement slurry with the following properties:
 - .1 Conform to CSA Standard A23.1, Section 7.6.4.2.
 - .2 1:1 Cement/Sand mortar, mixed to a cream-like consistency, with maximum water to cement ratio of 0.40.

- .3 For pre-bagged concrete repairs product: Use bonding agent as recommended by the pre-bagged concrete repair product manufacturer.

2.9 FORMWORK LUMBER

- .1 Formwork materials to conform to CSA A23.1. Plywood and wood formwork to be new or otherwise clean and free of any laitance materials.

2.10 GALVANIC ANODES

- .1 Embedded galvanic anodes shall be Anode Type 1A Class C with the following nominal dimensions: 32 mm x 34 mm x 100 mm. The anodes shall be pre-manufactured with a nominal 100 grams of zinc in compliance with ASTM B418 Type II cast around an integral, unspliced, uncoated, non-galvanized double loop steel tie wire and encased in a highly alkaline cementitious shell with a pH of 14 or greater.
- .2 The galvanic anodes shall be alkali-activated and shall contain no intentionally added chloride, bromide or other constituents that are corrosive to reinforcing steel as per ACI 562.

PART 3 EXECUTION

3.1 DEMOLITION

- .1 Refer to Section 02 41 16.01 Structure Demolition-Concrete Removal

3.2 PREPARATION OF EXISTING REINFORCING STEEL

- .1 Sandblast reinforcement to NACE No. 4/SSPC-SP 7.
- .2 Ensure that adequate precautions are undertaken to protect the surrounding environment from damage resulting from blast cleaning operations.
- .3 Waterblast or sandblast repair area concrete substrate until the concrete substrate is free of all loose and/or fractured concrete, dirt and corrosive products.
- .4 Sandblast any areas where welding has been performed to remove all welding contaminants.
- .5 Dispose of all abrasives and debris resulting from blast cleaning operations off site.
- .6 Identify damaged or severely corroded reinforcement exhibiting greater than 10% loss of cross sectional area. Replace, splice or supplement with new bars of the same diameter, length and type as existing as directed by Departmental Representative. Where new bars are spliced to existing bars, lap splices to conform to CSA A23.3.
- .7 Install galvanic anodes (refer to section 3.3)

- .8 Apply epoxy coating to all exposed, clean reinforcing steel. Apply epoxy in accordance with the manufacturer's written instructions to completely cover all steel which does not have a factory applied coating. After curing, the coating shall be free of holes, voids, cracks, damaged areas, contamination, and deficient areas that are discernible without magnification. Dry Film Thicknesses (DFT) of the coating to be between 0.20 mm and 0.35 mm (8 mils and 14 mils). A minimum of two coats will be required to achieve the specified DFT. DFT of the coating will be randomly tested with a DFT gauge.

3.3 GALVANIC ANODE INSTALLATION

- .1 Install anode units immediately following preparation and cleaning of the steel reinforcement, prior to field epoxy coating.
- .2 Galvanic anodes shall be installed at every bar along the perimeter of the ledge beam repair at a maximum spacing of 300mm

3.4 DOWELS

- .1 Drill and clean holes in parent concrete for dowels per adhesive manufacturers written recommendations.
- .2 Embed black steel in parent concrete to depth directed by Departmental Representative, adhered with approved epoxy adhesive.

3.5 NEW REINFORCING STEEL INSTALLATION

- .1 Place new steel to provide the same concrete cover as the existing steel to a minimum of 25mm cover.
- .2 Securely tie reinforcing steel together with coated tie wire to prevent displacement during concrete placing and vibrating.

3.6 FORMWORK CONSTRUCTION

- .1 Construct formwork to achieve the quality of finish specified.
- .2 Design formwork and falsework for construction loads and fluid pressures without overstressing the material and without excessive deflection.
- .3 Make forms tight and flush faced to prevent the leakage of mortar and the creation of unspecified fins or panel outlines.
- .4 Construct all formwork so that it can be readily removed without damage or shock to the concrete or spalling of edges. Apply a form coating and release agent uniformly to the contact surface of formwork panels before reuse.
- .5 Be responsible for the safety of the structure before and after the forms are removed. In no case shall forms and supporting shores be removed until members can support their own weight and superimposed construction loads without excessive stress, deflection, or distortion.

3.7 PREPARATION OF CONCRETE

- .1 Air/water blast entire area to remove all debris from formwork.
- .2 Thoroughly wet prepared concrete surface with potable water for a period of not less than one hour prior to placement of repair concrete or mortar. Blow clear puddles and/or free water from the repair surface. Ensure substrate is saturated surface dry prior to application of repair mortar, grout or concrete.
- .3 Work cement slurry into dampened concrete surfaces with a stiff brush. Install the repair concrete or mortar while the slurry is wet.
- .4 Apply bonding agent to concrete surface prior to placement of repair concrete or mortar. Scrub bonding agent into surface with stiff brush, fully filling all voids and irregularities. Install repair concrete or mortar while bonding agent is wet. If bonding agent is allowed to dry, an additional coat must be applied.

3.8 CONCRETE MIX INSTALLATION

- .1 Place and consolidate concrete in through slab repair patches prior to concrete placement in adjacent top surface repair patches.
- .2 Consolidate concrete with plastic tipped pencil vibrators without causing segregation.
- .3 Repair improperly consolidated areas at soffit around breakthrough patch perimeters.

3.9 CURING

- .1 Wet cure concrete at a temperature of at least 10°C for a period of 7 days or for the time necessary to reach 70% of the specified 28-day compressive strength.
- .2 Cure pre-bagged concrete and polymer modified mortars in accordance with manufacturer's written instructions.
- .3 Do not use curing compounds on the top surface of slabs.
- .4 Ensure curing compounds used on soffit and vertical surface areas are compatible with any coatings to be applied.

3.10 CONCRETE FINISH

- .1 Finish surface to the lines and levels of adjacent concrete. Provide level markings on columns or walls and grade markers at areas away from columns or walls, as necessary, to ensure proper slopes. Slope top surfaces away from walls and columns.
- .2 Provide a steel trowel finish.

3.11 FORMWORK REMOVAL

- .1 Do not commence form removal and re-shoring until concrete has reached 75% of the specified 28 day compressive strength or as otherwise directed by shoring Engineer.

3.12 NON- SHRINK GROUT FOR SHORING

- .1 Provide non- shrink grout under base plates. Do not apply any loads to the steelwork before grout achieves sufficient strength.

END OF SECTION 03 01 37

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Not used.

1.2 REFERENCE STANDARDS

- .1 ASTM International (ASTM).
 - .1 ASTM A 36/A 36M-19, Standard Specification for Carbon Structural Steel.
 - .2 ASTM A 307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM F3125/F3125M-18, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- .3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
 - .1 Handbook of the Canadian Institute of Steel Construction.
 - .2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.
- .4 CSA Group (CSA)
 - .1 CSA G40.20/G40.21-13(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16-19, Limit States Design of Steel Structures.
 - .4 CAN/CSA-S136-12, North American Specifications for the Design of Cold Formed Steel Structural Members.
 - .5 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel.
 - .6 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
 - .7 CSA W55.3-08(R2018), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .8 CSA W59.2-18, Welded Steel Construction (Metal Arc Welding).
- .5 Master Painters Institute
 - .1 MPI-INT 5.1-08, Structural Steel and Metal Fabrications.
 - .2 MPI-EXT 5.1-08, Structural Steel and Metal Fabrications.
- .6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International
 - .1 NACE No. 3/SSPC SP-6-06, Commercial Blast Cleaning.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittals
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
- .3 Erection drawings:
 - .1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
 - a) Description of methods.
 - b) Sequence of erection.
 - c) Type of equipment used in erection.
 - d) Temporary bracings.
- .4 Fabrication drawings:
 - .1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the Province of Ontario, Canada.
- .5 Source Quality Control Submittals:
 - .1 Submit mill test reports 4 weeks prior to fabrication of structural steel.
 - e) Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
 - f) Provide mill test reports certified by metallurgists qualified to practice in the Province of Ontario, Canada.
- .6 Fabricator Reports:
 - g) Provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with 01 00 10 - General Instructions. .
- .2 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16 and CAN/CSA-S136 with CSA-S136.1 to resist forces, moments, shears and allow for movements indicated.

- .2 Shear connections:
 - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
 - .2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.
 - .3 For composite construction select or design minimum end connection to resist reaction resulting from factored movement resistance as tabulated in the "Handbook of the Canadian Institute of Steel Construction" assuming 100% shear connection with depth of steel deck and/or slab shown on drawings.
 - .4 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in the Province of Ontario, Canada for non-standard connections.

2.2 MATERIALS

- .1 Structural steel: to CSA-G40.20/G40.21 with the following grades:
 - i) W, WWF AND S SECTIONS, CHANNELS AND ANGLES: ASTM A992, GRADE 50 (345MPa).
 - ii) PLATES, BARS: 300W
 - iii) HOLLOW STRUCTURAL SECTIONS: 350W (CLASS 'C' OR 'H'), ASTM A1085 GRADE 50 (345 MPa) OR ASTM A500 (GRADE 'C'). USE ONLY ASTM A1085 WHERE SPECIFICALLY INDICATED ON DRAWINGS.
 - iv) PIPE: ASTM A53, 240W
 - v) BOLTS: ASTM F3125 GRADE A325M, UNLESS NOTED
 - vi) HEADED STUDS: CSA W59, TYPE B, min. $F_y = 350$ MPa
 - vii) ANCHOR RODS: 300W OR ASTM F1554 GRADE 36
- .2 Anchor bolts: to CSA-G40.20/G40.21, or ASTM 1554.
- .3 High strength anchor bolts: refer to drawings.
- .4 Bolts, nuts and washers: refer to drawings.
- .5 Welding materials: to CSA W59 and certified by Canadian Welding Bureau.
- .6 Shop paint primer: to **CISC/CPMA 2-75** solvent reducible alkyd, red oxide.
- .7 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m².
- .8 Shear studs: to CSA W59, Appendix H.

2.3 FABRICATION

- .1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with approved shop drawings.
- .2 Install shear studs in accordance with CSA W59.
- .3 Continuously seal members by intermittent welds and plastic filler.
- .4 Provide holes in beam flanges or Weld threaded studs as required for attachment of wood nailers.

- .5 Clean surfaces down to bare metal and apply two coats of zinc-rich touch-up paint to any galvanized surface that has been damaged or field welded.
 - .1 If structural steel is in direct contact with ground (e.g. column base is not encased in concrete), protect with epoxy paint.
 - .2 Provide all erection bracing required to keep the structure stable and in alignment during construction.
 - .3 Distribute hanger loads from mechanical and heavy electrical services suspended from steelwork uniformly along members. alternate hanger position on either side of members.
 - .4 Connect hangers for mechanical and electrical services and other non-structural elements not to cause twisting of steel members or excessive bending of member flanges.
 - .5 Do not apply lateral loads to members unless approved by the Departmental Representative.

2.4 SHOP PAINTING

- .1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16 and CAN/CSA-S136 except where members to be encased in concrete.
- .2 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface according to NACE No.3/SSPC-SP-6.
- .3 Apply one coat of primer in shop to steel surfaces to receive a finish coat of paint on site, except:
 - .1 Surfaces to be encased in concrete.
 - .2 Surfaces to receive field installed stud shear connections.
 - .3 Surfaces and edges to be field welded.
 - .4 Faying surfaces of slip-critical connections.
 - .5 Below grade surfaces in contact with soil.
- .4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.
- .5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

PART 3 EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

- .1 Structural steel work: in accordance with CAN/CSA-S16.
- .2 Welding: in accordance with CSA W59.

- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.3 CONNECTION TO EXISTING WORK

- .1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Departmental Representative for direction before commencing fabrication.

3.4 MARKING

- .1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.5 ERECTION

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and CAN/CSA-S136 and in accordance with approved erection drawings.
- .2 Field cutting or altering structural members: to approval of Departmental Representative.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.

3.6 FIELD QUALITY CONTROL

- .1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Departmental Representative.
- .2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.
- .3 Submit test reports to Departmental Representative within 2 weeks of completion of inspection.
- .4 Contractor shall include the cost of tests in their bid price.
- .5 Departmental Representative will provide periodic field review of a representative sample of the structural works detailed on the drawings for general conformance with contract documents. These reviews do not replace the contractor's responsibility to implement and maintain a quality control program, and do not make departmental representative a guarantor of the contractor's work.
- .6 Construction review reports will outline any deficiencies found.
- .7 Bring to the attention of Departmental Representative any deficiencies found in the work together with a proposal for remedy. Departmental Representative will decide what corrective action may be taken and issue the necessary instructions.

- .8 Provide reasonable notice (not less than 24 hours) to allow for the field review of the following:
 - .1 Concrete walls, beams and columns: before closing forms
 - .2 All other concrete: before each concrete pour
 - .3 Structural steel: before covering up or placing steel
 - .4 Wood framing: before covering up
- .9 Schedule review work to occur during normal business hours.
- .10 Organize for field review of all proprietary products and other structural works designed by specialty engineers. the review to be by the engineers responsible for the design or by other engineers designated by the engineers responsible for the design and licensed in the place where the project is located. submit construction review reports for departmental representative's record.

3.7 FIELD PAINTING

- .1 Touch up damaged surfaces and surfaces without shop coat with primer to NACE No.3/SSPC-SP-6 except as specified otherwise. Apply in accordance: MPI Architectural Painting Specification Manual.

3.8 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION 05 12 23

PART 1. GENERAL

1.1 DESCRIPTION

- .1 This section specifies the requirements for the supply and installation of the elements required for waterproofing parking decks.
- .2 Waterproofing system: Parking Garage Grade, High Wear Modified Bituminous Sheet Waterproofing Membrane.

1.2 RELATED REQUIREMENTS

- .1 Section 03 01 37 – Concrete Restoration

1.3 REFERENCES

- .1 Current issue or latest revision.
- .2 In case of conflict most stringent requirement to govern.
- .3 Manufacturers' published technical data sheets and installation instructions.
- .4 Canadian Roofing Contractors Association (CRCA)
- .5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
- .6 Material Safety Data Sheets (MSDS).
- .7 American Society for Testing and Materials (ASTM)
 - .1 D93 – Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester
 - .2 D5957 – Standard Guide for Flood Testing Horizontal Waterproofing Installations
 - .3 F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - .4 F2659 – Standard Guide for Preliminary Evaluation of Comparative Moisture Condition of Concrete, Gypsum Cement and Other Floor Slabs and Screeds Using a Non-Destructive Electronic Moisture Meter
- .8 International Organization for Standardization (ISO)
 - .1 9001 – Quality management systems
 - .2 14001 – Environmental management systems

1.4 SUBMITALS

- .1 Submit an electronic copy, of the most current technical data sheets. These documents must describe the physical properties of the material, and explanations about product installation, including installation techniques, restrictions, limitations and other manufacturer recommendations.

1.5 QUALITY ASSURANCE

- .1 The manufacturer of elastomeric bitumen products will provide proof of ISO 9001 and ISO 14001 Certifications.
- .2 Manufacturer's representative
 - .1 At all times, the contractor is to permit and facilitate access to the site by the Departmental Representative and the product manufacturer's representative.

1.6 MATERIALS STORAGE

- .1 Materials should be handled with care and proper equipment.
- .2 Materials to be carefully stored and adequately protected in accordance with the manufacturer's recommendations.

1.7 INSPECTION AND TESTING

- .1 Notify and obtain the Departmental Representative's approval for the following work:
 - .1 Surface Preparation.
 - .2 Treatment of cracks and control joints.
 - .3 Detailing at expansion joints, upturns etc.
 - .4 Placement of membrane components.
 - .5 Placing and finishing concrete topping.
- .2 Leakage Testing:
 - .1 Conduct water test upon completion of the waterproofing assembly and prior to installing asphalt, as per ASTM D5957.
 - .2 Plug drains on horizontal surfaces and restrict run-off.
 - .3 Saturate topping with water to depth of 50mm, allow to stand at least 24 hours.
 - .4 If leaks occur repair and retest.

PART 2. PRODUCTS

2.1 WATERPROOFING MEMBRANES

.1 Top layer

- .1 Description: A waterproofing membrane composed of non-woven polyester reinforcement and SBS modified bitumen. The top face is sanded finish, the under face is covered with a thermofusible plastic film.

.2 Characteristics:

- | | |
|--|----------------------------|
| 1. Thickness: | 4.5 mm |
| 2. Roll size: | 1m x 8m |
| 3. Tensile strength (kN/m): longitude. (MD) = | 17.0 – transv. (XD) = 11.5 |
| 4. Elongation maximum load (%): longitud. (MD) = | 50.0 – transv. (XD) = 65.0 |
| 5. Low temperature flexibility: | - 20 °C |
| 6. Static puncture resistance (N): | 215 |

.2 Primer (solvent base)

- .1 Description: A blend of SBS modified bitumen, fast-evaporating solvents and adhesive enhancing additives. It is required to prime concrete and metal surfaces to improve the adhesion of torch-applied waterproofing membranes.

.2 Characteristics:

- | | |
|--|----------------------------|
| 1. Specific gravity at 20 °C (kg/l): | 0.91 |
| 2. Colour: | Black |
| 3. Solids by weight (%): | 35 |
| 4. Viscosity, Brookfield (cps, 25 °C): | 50 |
| 5. Flash point, ASTM D-93 (°C): | -3 (26 °F) |
| 6. Drying time on smooth surfaces:
temperature and quantity applied | 1 to 12 hours depending on |

.3 Primer (bituminous emulsion)

- .1 Description: A bituminous emulsion (stabilized blend of bitumen and water without solvent). It is required to prime concrete and metal surfaces to improve the adhesion of thermofusible

waterproofing membranes.

.2 Characteristics:

- | | |
|--|---------------------|
| 1. Specific gravity at 20 °C (kg/l): | 1.00 |
| 2. Colour: | Dark brown |
| 3. Solids by weight (%): | 44 |
| 4. Viscosity, Brookfield (cps, 25 °C): | 675 |
| 5. Flash point (ASTM D-93): | n/a – non-flammable |

2.2 MEMBRANE FOR UPSTANDS AND DETAILS

- .1 Unless approved otherwise by Manufacturer in writing, membrane for upstands and details to be liquid membrane and reinforced as follows;

.2 LIQUID MEMBRANE FOR UPSTANDS AND DETAILS

- .1 Description: A ready to use one-component polyurethane and bitumen waterproofing resin which can be applied directly on substrate without primer.

.2 Characteristics:

- | | |
|--|-----------------------------------|
| 1. Physical state: | Brown viscous liquid |
| 2. Density at 25 °C (g/l): | 1070 |
| 3. Solids content (%): | 80 |
| 4. Minimum application temperature (°C): | 5 (41 °F) |
| 5. Drying time ready to recoat after: | 2 hours |
| 6. Dry: | 12 hours (remains tacky to touch) |

.3 LIQUID MEMBRANE REINFORCEMENT

- .1 Description: A flexible reinforcement made of 100 g/m² woven polyester used for angle change at upstands, support junctions and joints.
- .2 Format: 0.15 m (6 in) wide x 30.5 m (100 ft) long strip.

PART 3. EXECUTION

3.1 EXAMINATION AND PREPARATION OF SURFACES

- .1 Concrete must be cured following local requirements.
- .2 Concrete substrate should have a maximum moisture content of 1,5 kg/100m²/24h (ASTM F1869) or 6% (ASTM F2659).
- .3 Concrete must respect CSP 3 to CSP 6 from International Concrete Repair Institute (ICRI).
- .4 The substrates must be free from grooves, cavities and incisive objects.
- .5 Concrete substrate must be prepared by shot blasting with steel balls. Surface must be clean, dry, free of laitance and/or contamination by concrete treatment products, oils, diesel oil, or grease etc. These products could affect the adhesion or the physical integrity of the membrane.
- .6 In case contamination after shot blasting, surface must be abraded to remove contaminants. It is not recommended to use liquid products to remove contaminants.
- .7 Do not install materials in conditions of snow or rain. Use of salt or calcium is forbidden to remove ice or snow.
- .8 An adhesion test is recommended before membrane application

3.2 METHOD OF EXECUTION

- .1 Install waterproofing products on properly prepared surfaces.
- .2 Waterproofing work to be performed on a continuous basis as surface and weather conditions allow.
- .3 Adjoining surfaces to be protected against any damage that could result from the waterproofing installation.
- .4 Make sure to remove adhesive identification tapes on rolls of membranes.

3.3 EQUIPMENT

- .1 Maintain all equipment and tools in good working order.
- .2 Unless approved otherwise by membrane manufacturer, use automated membrane installation machine that meets the following requirements:
 - .1 Installs 1 m x 8 m rolls.
 - .2 Self-guidance system.
 - .3 Hot air blowers heat-welding the membrane.
 - .4 Pressure roller optimising adherence.
 - .5 Certified safety equipment.

3.4 DECK PREPARATION

- .1 Prepare the surfaces according to manufacturer's recommendations.

3.5 PRIMER APPLICATION

- .1 Surfaces where heat-welded membranes will be applied must receive a primer coating at the rate of 0.15 to 0.20 l/m². Primer must be dry before application of the membrane.

3.6 WATERPROOFING MEMBRANE INSTALLATION

- .1 The membrane shall be installed parallel to the longitudinal axis of the structure. The strips should preferably be unrolled in the direction of circulation. On curved surfaces of the structure, the strips should be laid out so that the angle with the axis of circulation does not exceed 60 °.
- .2 This membrane will be welded onto the concrete support, which will have received a primer as a preliminary.
- .3 Waterproofing membrane shall have side laps of 75 mm (3 in) and end laps of 150 mm (6 in). Prepare end laps by embedding granule on the 150 mm (6 in) strip of membrane to be overlapped.
- .4 Make sure the membrane is properly welded providing a smooth application free of air pockets, fishmouths or tears.
- .5 After installation of the membrane, check all lap seams.

- .6 Wrinkle repair: Degranulate the membrane around the wrinkle in all directions within a 150 mm (6 in) radius. Cut and remove the wrinkled area of the membrane. Install a membrane patch extending minimum 150 mm (6 in) beyond limits of repair area. Use trowel to treat terminations membrane.

3.7 INSTALLATION OF LIQUID MEMBRANE FOR UPSTANDS AND DETAILS

- .1 Using a paint brush, roller or trowel, coat the transition at the bottom of the upstand with a layer of membrane flashing 100 mm (4 in) horizontally and minimum 100 mm (4 in) vertically above the top of the wearing surface. Do not install more than 3 m (10 ft) of resin prior to the installation of the reinforcement.
- .2 Follow immediately with reinforcement, which is installed on the wet membrane flashing, using a trowel or paintbrush. Repeat this step so as to cover the entire surface to be waterproofed. The membrane flashing reinforcement strips must overlap each other by a minimum of 50 mm (2 in).
- .3 Immediately coat the top of the reinforcement and the overall upstand or detail with liquid membrane flashing.
- .4 When the first coat has dried (for 2 to 3 hours at an ambient temperature of 20 °C), cover with a finish coat along the entire detail surface.

3.8 WATERPROOFING FOR VARIOUS DETAILS

- .1 Install waterproofing membranes in conformance with various details as indicated on the constructions plans and as illustrated in the membrane manufacturer's specifications and installation manual.

END OF SECTION 07 13 52.16

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This Section specifies the supply and application for thin system traffic deck waterproofing protection systems for parking garage slabs

1.2 REFERENCE STANDARDS

- .1 American Society of Testing and Materials (ASTM)
 - .1 ASTM Standard C957 (2015), Standard Specifications for High-Solids content, Cold Liquid – Applied Elastomeric Waterproofing Membrane with Integral Wearing Surface
 - .2 ASTM Standard D4263-83(2012) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
- .2 Canadian Standards Association (CSA)
 - 1. CAN/CSA S-413-14, Parking Structures
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - 2. Material Safety Data Sheets (MSDS)

1.3 PERFORMANCE REQUIREMENTS

- .1 The protective system as applied shall:
 - .1 be fully cured within 48 hours of application
 - .2 be fully bonded to the substrate surfaces and between all components of the system.
 - .3 prevent access of waterborne material to the concrete substrate.
 - .4 provide a tough wearing surface and provide adequate skid resistance for existing uses.
 - .5 maintain these properties with exposure to the service conditions of the structure, including temperature, de-icing agents, petroleum products and ultraviolet exposure.
 - .6 be a colour approved by the Departmental Representative.

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures and Section 01 78 00 – Close Out Submittals
- .2 Product Data:
 - .1 Submit product data sheets for all components of the specified traffic topping system for Departmental Representative review and approval.
 - .2 Submit colour sample chart.
- .3 Manufacturer Information:

- .1 Submit system Manufacturer's review letter certifying that the materials supplied, preparation and application is in accordance with the Manufacturer's specifications.
- .2 Submit Manufacturer's Maintenance Manual including procedures for cleaning.
- .3 Submit system Manufacturer's letter confirming the compatibility of the proposed system with existing coatings/traffic deck systems.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Store all materials delivered to the site in the original containers with unbroken seals and intact labels clearly identifying the products.
- .2 Store and protect containers from extreme temperatures (hot and cold), direct sunlight and inclement weather in accordance with Manufacturer's written instructions. Store in a well ventilated area.
- .3 Take all necessary precautionary measures to prevent fire hazards and spontaneous combustion.
- .4 Where combustible materials and solvents are used, take appropriate precautions and enforce no smoking in the vicinity of the materials.

1.6 INSPECTIONS AND TESTING

- .1 Coordinate for the product Manufacturer's representative to visit the site, at appropriate intervals, to:
 - .1 Attend pre-construction meeting to review and approve project details and specifics.
 - .2 Provide training of installers when needed.
 - .3 Approve substrate surface preparation
 - .4 Approve all mock ups.
- .2 Notify and obtain the Departmental Representative's approval for the following work:
 - .1 Surface preparation
 - .2 Treatment of cracks and control joints.
 - .3 Detailing at expansion joints, drains, upturns etc.
 - .4 Placement of membrane components.
 - .5 Checking that a completely bonded system is produced.
 - .6 The dry or wet thickness of the membrane
- .3 The Departmental Representative, at their discretion, may require test cuts and bond tests on various components or the completed mock-up and/or during general application
- .4 Bond tests will be considered as failed, if in any location the bond strength is less than 1.0 MPa.
 - .1 Failed mock-up bond test: The full extent of the failed mock-up will be removed and system re-installed as per reviewed and modified procedure and area retested until satisfactory results are obtained.
 - .2 Failed bond test during general repairs: The full extent of the failed system, as determined by the Departmental Representative, will be removed and system re-installed. Additional bond testing may be performed at the Departmental Representative's discretion.

- .5 Repair the traffic deck system at test cut and bond test locations at no additional cost .

1.7 ENVIRONMENTAL CONDITIONS

- .1 Apply coatings only when environmental conditions (including ambient and substrate temperatures, relative humidity, substrate moisture content, etc.) during application and curing remain within the limits of the Manufacturer's written instructions.
- .2 The moisture content of the slab shall be recorded at the time of application and shall be acceptable to the Departmental Representative and Manufacturer for the materials applied.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Protect with a specified system, including the appropriate wear course exposure applications for parking spaces, drive aisles, turning radii, ramps and extreme exposure areas to the extent shown on the Drawings.

2.2 MATERIALS

- .1 Cleaning Products
 - .1 Use solvent free cleaning products as recommended by the Manufacturer.
- .2 Traffic Coatings
 - .1 Use only products from the same manufacturer for all traffic coating system.
 - .2 Use chemically curing, fluid applied, polyurethane-methacrylate traffic coating system conforming to CSA S413 and ASTM C 957 with the following material properties:
 - .1 Primer: Methyl-methacrylate (MMA), two-component primer as required by manufacturer.
 - .2 Base Coat membrane: Two-part, polyurethane methacrylate base coat with the following properties:
 - .1 Crack Bridging to ASTM C 957
 - .2 Tensile Strength to ASTM D 638: Greater than 7 MPa
 - .3 Elongation to ASTM D 638: Greater than 400%
 - .3 Intermediate /top coat: Two-part, polyurethane methacrylate base coat with the following properties:
 - .1 Tensile Strength to ASTM D 412: Greater than 6.5 MPa
 - .2 Elongation to ASTM D 412: Greater than 100%
 - .3 Hardness (Shore A) to ATM D 2240: Greater than 75
- .3 Aggregate
 - .1 Apply aggregate to traffic coating in accordance with manufacturer specifications, including gradation selection.
- .4 Sealants

- .1 Provide sealant as recommended by membrane manufacturer.

PART 3 EXECUTION

3.1 QUALITY CONTROL

- .1 Maintain on site at all times calibrated equipment for measuring temperatures and concrete moisture content. Take measurements on a regular basis for quality control requirements and when directed by the Departmental Representative.
- .2 Provide adequate venting and barriers to prevent fume dispersion into building.

3.2 REMOVAL OF EXISTING TRAFFIC TOPPING SYSTEM AND PAINTED MARKINGS

- .1 Remove all existing traffic topping system that is loose and debonded. Existing traffic topping that is fully bonded will remain.
- .2 Use mechanical grinding to provide a feathered edge at the perimeter of the remaining existing traffic topping system.
- .3 Remove existing built-up painted markings to expose the surface of the existing traffic topping system.

3.3 SURFACE PREPARATION - GENERAL

- .1 Provide all surfaces to receive membrane and sealant are sound, dry, clean and free of all dirt, dust, oil, grease, wax, soap, paint, glue, curing compounds, laitance and any other foreign material before membrane installation commences.
- .2 Prepare surfaces to receive membrane in accordance with manufacturer's instructions.

3.4 SURFACE PREPARATION FOR CONCRETE

- .1 Chain drag entire area of concrete surface to receive new membrane and identify areas of unsound concrete for Departmental Representative review.
- .2 Do not undertake installation of the membrane on new concrete surfaces until a minimum cure time of 28 days is achieved or until the desired moisture content of the concrete or repair mortar, as recommended by the manufacturer in writing, has been achieved and verified by testing.
- .3 Provide the minimum cure time, as recommended by the membrane manufacturer's written instructions, prior to installing membrane over repairs involving other cementitious materials. Curing period shall be 28 days unless otherwise specified and approved by Departmental Representative.
- .4 Ensure the slab has sufficiently cured (dried) and the moisture content in the concrete substrates within the membrane manufacturer's limits during the application of the membrane. Perform ASTM D4263 test to qualitatively assess the moisture content of concrete or other testing as recommended by the Manufacturer.

- .5 Mechanically abrade all concrete surfaces to receive membrane to expose sound, laitance free concrete. Acceptable methods of mechanical abrasion include blast tracking, sandblasting and surface grinding with diamond bit cup blades.
- .6 Remove any existing crack sealant materials which are not compatible with the new system and replace with approved sealant.
- .7 Carry out repairs or remedial work to the concrete surface before the mechanical abrasion and sandblasting operations.
- .8 Prepare all areas where the surface is rough or where ridges exist to provide an acceptable surface for the membrane.
- .9 Remove all dirt and debris from the concrete surface prior to application of the surface primer (where required by membrane manufacturer) or base membrane.
- .10 Immediately prior to the application of the surface primer or base membrane, clean the concrete using vacuuming and/or high-pressure air to remove all dust and other foreign material.
- .11 Accompany the Departmental Representative on a tour of the completed surface preparation works upon completion of all work under this Section. Complete all required remedial work to bring surface preparations to a level acceptable to the Departmental Representative and the Contractor.

3.5 TREATMENT OF CRACKS

- .1 Prior to the application of the surface primer, or base membrane course for primerless systems, review and delineate cracks in slab that will require treatment prior to system application. Treat cracks as follows:
 - .1 Cracks in slab less than 1.5mm wide:
 - .1 Prime as recommended by the membrane manufacturer and apply waterproofing membrane 150mm wide centered on crack to 0.75mm (30mils) dry film thickness.
 - .2 Cracks in slab wider than 1.5mm
 - .1 Rout cracks to 6mm wide x 6 mm deep
 - .2 Prime routed crack as required by sealant manufacturer and install an approved bond breaker.
 - .3 Install sealant in accordance with manufacturer's written instructions. Tool sealant to provide finish flush with adjacent surfaces.
 - .4 Apply a double coat of base membrane over the routed crack to 150mm wide, centred on the crack.
 - .5 Apply reinforcing fabric if required by manufacturer.

3.6 SURFACE PRIMER

- .1 Apply surface primer as required in accordance with manufacturer's written instructions.

3.7 PREPARATION AT UPTURNS

- .1 Install a continuous 12mm x 12mm sealant fillet bead at all upturns prior to the installation of the base membrane.

- .2 For concrete upturns, apply detail coat of primer and membrane on the prepared surface 30 mils in thickness 150mm on the vertical surface and on the horizontal surface.
- .3 Perform this work prior to the general application of the surface primer or base membrane.

3.8 APPLICATION

- .1 Store, handle, mix, apply and cure materials in accordance with the applicable manufacturer's specifications, except where specifically modified herein.
- .2 Before submitting the tender, visit the site and inspect the existing slabs to be treated. Assess the requirements for reinforcement at cracks, construction joints and corners, sleeves and curbs, and shall provide same within the stipulated sum.
- .3 Coordinate the placement of the protective waterproofing systems with drains, pipes and other items and finish the overlay properly and seal around such items. Provide a tooled joint, filled with an approved sealant, around existing slab drains prior to waterproofing application. Produce a waterproof joint at all junctions with other materials.
- .4 Upturn membrane onto vertical surfaces. Provide a clean, straight termination.
- .5 Where waterproofing is installed in more than one phase, provide a minimum 150mm overlap between phases by overlapping each of the membrane course and wear course 75mm. Each overlap shall be offset from the of the course below. Ensure all surfaces are clean prior to overlapping material and prime as required by the manufacturer.
- .6 Upturn height:
 - .1 Interior: 150mm

1.2 TRAFFIC MARKINGS

- .1 Reinstate traffic markings to match original layout unless otherwise specified.
- .2 Where localized waterproofing repairs intercept existing traffic markings, repaint the full traffic marking.

END OF SECTION 07 18 00

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This Section specifies the supply and application of extruded elastomeric seals with elastomeric nosings and EPDM based sheet joints to expansion joints to provide watertight expansion control system that is capable of accommodating multi-directional movement.

1.2 SUBMITTALS

- .1 Submit Manufacturer's typical expansion joint cross-section(s) details indicating joint system pertinent dimensioning, general construction, blockout dimensions and product data information.
- .2 Approved Installers shall prepare and submit details of all special conditions to the Manufacturer for review and approval prior to installation.
- .3 Expansion Joint Seal Manufacturer Review Letter certifying that the materials supplied, preparation and installation of the expansion joint seal is in accordance with the Manufacturer's specifications.
- .4 Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS)

1.3 INSPECTIONS AND TESTING

- .1 Notify the Departmental Representative for inspection of:
 - .1 surface preparation
 - .2 application of expansion joint seal or sealant
 - .3 water test

PART 2 PRODUCTS

2.1 PREFORMED EXPANSION JOINT SEALS

- .1 General:
 - .1 The expansion joint seals should be a complete system to produce waterproof traffic bearing expansion joint seals accommodating $\pm 50\%$ opening and closing of the joint.
- .2 Preformed Expansion Joint Systems
 - .1 System shall consist of preformed santoprene thermoplastic rubber profiles with integral side flanges exhibiting a pronounced serrated profile and factory punched holes that interlocks into a preformed block-out by means of utilizing manufacture's ambient cure elastomeric concrete.
 - .2 Preformed thermoplastic joint properties:
 - .1 Tensile strenght to ASTM D412: Minimum 5.8 MPa.
 - .2 Elongation to ASTM D412: Minimum 300%

- .3 Hardness (Shore A) To ASTM D2240: Minimum 67
- .3 Elastomeric concrete properties:
 - .1 Compressive strength: Minimum 10 MPa.
 - .2 Hardness (Shore D) to ASTM D2240
- .4 Preformed thermoplastic joint and elastomeric concrete shall be from the same manufacturer.
- .5 Preformed thermoplastic joint shall be capable of accommodating omnidirectional movement.
- .6 At joint seal direction changes provide seals with factory heat welded splices. Only straight, butt splice connection shall be allowed on the jobsite following manufacturer's written instructions utilizing specialty heat fusing equipment or manufacturer specialty-splicing adhesive

2.2 EPDM-BASED SHEET JOINT

- .1 System shall consist of a monolithic expansion joint made of EPDM based synthetic rubber consisting of two flanges coated on the surface and under face and an expandable core.
- .2 EPDM BASED SHEET JOINT
 - .1 Tensile strength to ASTM D412: Minimum 10 MPa.
 - .2 Elongation to ASTM D412: Minimum 700%
 - .3 Hardness (Shore A) To ASTM D2240: Minimum 45
- .3 EPDM based sheet joint shall be from the same manufacturer as the modified bitumen sheet waterproofing membrane.

2.3 MECHANICAL FASTENING BAR

- .1 3mm x 25mm flat bar, hot dipped galvanized steel or aluminum with compatible countersunk fasteners, connected at 250mm spacing. Add fasteners where contact is not firm between fasteners.

PART 3 EXECUTION

3.1 PREFORMED EXPANSION JOINT SEALS

- .1 Arrange to have Manufacturer's representative visit the site prior to tendering to confirm size of seal necessary and during installation for review of preparation, materials supplied and installation.
- .2 Do not proceed with the joint installation without Manufacturer's written approval of surface preparation and attesting that the joint design, materials and installation are in accordance with Manufacturer's written instructions. Submit letter to Departmental Representative upon request.
- .3 Provide recess as required by seal type on each side of the expansion joint for accommodating the prefabricated extrusion. The concrete surface to which the seal is applied shall be spall-free and level. Sandblast surfaces to remove all laitance, expose aggregate and ensure proper bond of the nosing.
- .4 Mask areas adjacent to joint to assure neat, clean joint lines.

- .5 Unpack and lay the membrane seal element in a relaxed position to relieve any temporary coiling from shipment packaging prior to placement.
- .6 Wipe the winged flaps of the gland element with an acceptable non-petroleum solvent cleaner such as Xylol (Xylene) prior to application of elastomeric nosing materials.
- .7 Mix and apply and/or adhere nosing material in accordance with the Manufacturer's written instructions.
- .8 Seals that are to be installed in a compressed condition must be clamped to the width of the joint opening before placement of the elastomeric concrete nosing and before bedding material cures.
- .9 Where elastomeric traffic deck waterproofing systems are employed, finish nosing flush with concrete surfaces and provide tooled reglet against nosing as per Drawings.
- .10 Upturns & Terminations
 - .1 Where terminating ends of expansion joints at walls and columns, extend joint seals vertically onto walls or columns, including cutting of block-outs and recessed joint seal into block out, to a minimum of 150 mm
 - .2 Where the expansion joint seal runs along the upturn face of a column or a wall, upturn and mechanically fasten the vertical flap with a fastening bar and compatible countersunk fasteners into the vertical block out. Coat the vertical flap and fastening assembly in resin.
- .11 Joint Seal Directional Changes & Splicing:
 - .1 Ship in the longest continuous length in Manufacturer's standard shipping size to allow for continuous installation without joints where practical and to minimize total number of required splices.
 - .2 Execute all tees, crosses direction changes, terminations and transitions using factory fabricated assemblies. Extend factory fabricated assemblies a minimum of 2'-0" in each direction from the splice for welding to continuous gland lengths.
 - .3 Permit only straight, butt splice connections on the jobsite.
 - .4 Heat splice field seams, only with the approval of the Manufacturer and Departmental Representative. Perform field seams only by equipment designed for such a purpose, with gauges to determine the temperature of the gland during the weld, and a mechanism to maintain the glands in place during the weld. Equipment used must be approved by the Manufacturer and the Departmental Representative.
 - .5 Incorporate bonding of the complete seal profile for all factory and field fused connections, including fusing of all internal and external web configurations.

3.2 EPDM-BASED SHEET JOINT

- .1 Surfaces to which the joint will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellent, and any other substances that may affect proper adhesion.
- .2 Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of the joint

3.3 CLEAN-UP & PROTECTION

- .1 Water test to verify integrity of new expansion joint seal to Departmental Representative's requirements.
- .2 Prevent traffic from crossing joints until the entire system is fully cured. Heavy construction vehicles will not be permitted to cross the joint without permission by the Departmental Representative. Subsequent damage to the Membrane System shall be repaired at the contractor's expense.

END OF SECTION 07 95 13

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with division 1.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario Canada.
 - .2 Drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 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 division 1: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with division 1.
- .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, Departmental Representative before final inspection.
 - .2 Approvals:
 - .1 Make changes as required and re-submit as directed by Departmental Representative.
 - .3 Site records:
 - .1 Departmental 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 to reproducible, revising reproducible to show work as actually installed.
- .3 Use different colour waterproof ink for each service.
- .4 Make available for reference purposes and inspection.
- .4 As-Built drawings:
 - .1 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).
 - .2 Submit to Departmental Representative for approval and make corrections as directed.
 - .3 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .5 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with division 1.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 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 Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied Departmental Representative.

3.2 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 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 CLEANING

- .1 Progress Cleaning: clean in accordance with division 1.
 - .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 division 1.

3.5 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION 21 05 01

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA 14-[07], Standard for the Installation of Standpipe and Hose Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with division 1.
- .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 registered or licensed in Ontario of 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 division 1.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in standpipe and hose assembly approved by manufacturer .
- .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 division 1.
- .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 indoor 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 DESCRIPTION

- .1 Design system to NFPA 14 and following parameters:
 - .1 Stand alone: pipe schedule.

2.2 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with division 1.
- .2 Grooved couplings and fittings made from minimum 90% recycled metal.

2.3 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to NFPA 14.
 - .2 Copper tube: to NFPA 14.
- .2 Fittings and joints to NFPA 14:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
 - .2 Copper tube: screwed, soldered, brazed.
- .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] [flanged] 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.

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 Install pipework in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified.
- .3 Run inspectors test connections to sight glass.

3.3 FIELD QUALITY CONTROL

- .1 Not used

3.4 SITE TEST

- .1 General:
 - .1 In accordance with NFPA 14, supplemented as specified.
 - .2 In accordance with Section division 1.
- .2 Testing witnessed by Departmental Representative.
- .3 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.
- .4 Co-ordination:
 - .1 Co-ordinate tests with performance verification of:
 - .1 Standpipe and hose systems specified Section
- .5 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 Adjust PRV on pump discharge to maximum pressure of 620 kPa at top fire hose station.
- .13 Adjust PRV's at lower fire hose stations to 550 kPa maximum.
- .14 Fill glycol legs, confirming proper operation of backflow preventers.
- .15 Adjust pressure switches.
- .6 Documentation:
 - .1 Provide written certification to Departmental Representative that system was installed, flushed and tested in accordance with appropriate codes.
 - .2 Certificate to include:
 - .1 Contractors name.
 - .2 Contractors address.
 - .3 Contractors licence 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 and welding conform to acceptable standards.
 - .8 Certification that system is complete and in service.
 - .9 Approved signage has been provided and attached as appropriate.

3.5 CLEANING

- .1 Clean in accordance with Section division 1.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION 21 12 01

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 National Fire Prevention Association (NFPA)
 - .1 NFPA 13-2007, Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 24-2007, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
 - .3 NFPA 25-2008, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN4 S543-M984, Standard for Internal Lug Quick Connect Couplings for Fire Hose.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with division 1.
- .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 registered or licensed in Ontario of 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 Samples:
 - .1 Submit samples of following:
 - .1 Each type of sprinkler head.
 - .2 Signs.
- .5 Test reports:

- .1 Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.
- .8 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 division 1 and in accordance with ANSI/NFPA 20.
- .2 Manufacturer's catalogue Data, including specific model, type, and size for:
 - .1 Pipe and fittings.
 - .2 Sprinkler heads.
 - .3 Pipe hangers and supports.
 - .4 Mechanical couplings.
 - .5 Electrical wiring diagrams.
- .3 Field Test Reports:
 - .1 Preliminary tests on piping system.
- .4 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.
 - .2 Submit 760 mm by 1050 mm drawings on reproducible Mylar film with title block similar to full size contract drawings.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in wet sprinkler systems approved by manufacturer.
- .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 division 1.
- .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 indoors 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 ABOVE GROUND PIPING SYSTEMS

- .1 Provide fittings for changes in direction of piping and for connections.
 - .1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.

2.2 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to NFPA 13.
 - .2 Copper tube: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
 - .2 Copper tube: screwed, soldered, brazed, grooved.
 - .3 Provide welded, threaded, grooved-end type fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .4 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.
 - .5 Fittings: ULC approved for use in wet pipe sprinkler systems.
 - .6 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
 - .7 Sprinkler pipe and fittings: metal.
- .3 Valves:
 - .1 ULC listed for fire protection service.

- .2 Gate valves: open by counter clockwise rotation.
- .4 Pipe hangers:
 - .1 ULC listed for fire protection services in accordance with NFPA.

2.3 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed for fire services.
- .2 Sprinkler Head Type:
 - .1 Type A: upright bronze.
 - .2 Type B: pendant chrome link and lever type.

2.4 ANTIFREEZE

- .1 Antifreeze loops to NFPA 13, locations as indicated.

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 division 26.

3.5 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 Unfinished Areas:
 - .1 Provide piping with self-adhering red plastic bands 50 mm wide red enamel bands spaced at maximum of 6 m intervals.

3.6 FIELD QUALITY CONTROL

- .1 Site Test, Inspection:
 - .1 Perform test to determine compliance with specified requirements in presence of Departmental Representative.
 - .2 Test, inspect, and approve piping before covering or concealing.
 - .3 Preliminary Tests:
 - .1 Hydrostatically test each system at 200 psig 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.
 - .6 Testing to be witnessed by Departmental Representative.

3.7 CLEANING

- .1 Clean in accordance with division 1.

END OF SECTION 21 13 13

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with division 1.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario], Canada.
 - .2 Indicate on 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 division 1.

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section division 1.
- .2 Operation and Maintenance Data: submit operation and maintenance data for for incorporation into manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental 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.
 - .4 Testing, adjusting and balancing reports as specified in Section [23 05 93 - Testing, Adjusting and Balancing for HVAC].
- .5 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 Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental 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 Departmental 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 to reproducible, revising reproducible 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 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).
 - .2 Submit to Departmental Representative for approval and make corrections as directed.
 - .3 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with division 1.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with division 1.
- .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 from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 NOT USED

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

3.2 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 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 CLEANING

- .1 Progress Cleaning: clean in accordance with Section division 1.
 - .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 division 1.

3.5

PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION 22 05 00

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 ASTM International Inc.
 - .1 ASTM D2235-04, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
 - .2 ASTM D2564-04e1, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-Series B1800-06, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with division 1.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies WHMIS MSDS - Material Safety Data Sheets in accordance with division 1.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with division 1.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Store at temperatures and conditions recommended by manufacturer.

PART 2 PRODUCTS

2.1 PIPING AND FITTINGS

- .1 For above ground DWV piping to:
 - .1 CAN/CSA B1800.

2.2 JOINTS

- .1 Solvent weld for PVC: to ASTM D2564.
- .2 Solvent weld for ABS: to ASTM D2235.

PART 3 EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 In accordance with Section 23 05 05 - Installation of Pipework.
- .2 Install in accordance with Provincial Plumbing Code and National Plumbing Code.

3.3 TESTING

- .1 Hydraulically test to verify grades and freedom from obstructions.

3.4 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 cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Storm water drainage:
 - .1 Verify domes are secure.
 - .2 Ensure weirs are correctly sized and installed correctly.
 - .3 Verify provisions for movement of roof system.
- .4 Ensure fixtures are properly anchored, connected to system and effectively vented.
- .5 Affix applicable label (storm, sanitary, vent, pump discharge) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 CLEANING

- .1 Clean in accordance with division 1.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION 22 13 18

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
 - .2 Commercial Interiors.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA B139-[04], Installation Code for Oil Burning Equipment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with division 1.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with division 1.
- .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 MATERIAL

- .1 Paint: zinc-rich to CAN/CGSB-1.181.
 - .1 Paints/Coating/Primers: in accordance with manufacturer's recommendations for surface conditions.
 - .2 Primer: maximum VOC limit 250 g/L to Standard GS-11.
- .2 Sealants: in accordance with division 7.
 - .1 Sealants: maximum VOC limit to SCAQMD Rule 1168.
- .3 Adhesives: maximum VOC limit to GSES GS-36.

PART 3 EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.3 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and CSA B139 and National Fire Code of Canada.
- .2 Provide space for disassembly, removal of equipment and components as CSA B139 without interrupting operation of other system, equipment, components.

3.4 PIPEWORK INSTALLATION

- .1 Install pipework to CSA B139
- .2 Screwed fittings jointed with Teflon tape.
- .3 Protect openings against entry of foreign material.
- .4 Assemble piping using fittings manufactured to ANSI standards.
- .5 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
 - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
- .6 Install exposed piping, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.
- .8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .9 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .10 Group piping wherever possible [and as indicated].
- .11 Ream pipes, remove scale and other foreign material before assembly.

- .12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .13 Provide for thermal expansion as indicated.

3.5 PREPARATION FOR FIRE STOPPING

- .1 Install firestopping within annular space between pipes , insulation and adjacent fire separation.
- .2 Uninsulated unheated pipes not subject to movement: no special preparation.
- .3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation.
- .4 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

3.6 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

- .1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.
- .2 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
- .3 Conduct tests in presence of Departmental Representative.
- .4 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.
- .5 Insulate or conceal work only after approval and certification of tests by Departmental Representative.

3.7 EXISTING SYSTEMS

- .1 Connect into existing piping systems at times approved by Departmental Representative.
- .2 Request written approval by Departmental Representative 10 days minimum, prior to commencement of work.
- .3 Be responsible for damage to existing plant by this work.

3.8 CLEANING

- .1 Clean in accordance with Section division 1.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION 23 05 05

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 This section covers items common to Sections of Division 26.

1.2 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
 - .2 CAN/CSA-C22.3 No.1, Overhead Systems.
 - .3 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 DEFINITIONS

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

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with division 1.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for Departmental Representative and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit for review single line electrical diagrams and locate as indicated.
 - .1 Electrical distribution system in main electrical room.
- .4 Submit for review fire alarm riser diagram, plan and zoning of building at fire alarm control panel and annunciator.
- .5 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

- .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
- .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 Drawings: 600 x 600 mm minimum size.
- .6 If changes are required, notify Departmental Representative of these changes before they are made.
- .6 Certificates:
 - .1 Provide CSA certified equipment.
 - .2 Where CSA certified equipment is not available, submit such equipment to authority having jurisdiction for approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3.1 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .7 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3.8 - FIELD QUALITY CONTROL.
- .8 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .2 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .3 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates.
 - .4 Building Energy and Water Consumption: for monitoring end-uses as follows:
 - .5 Lighting systems and controls.
 - .6 Constant and variable motor loads.
 - .7 Variable frequency drive (VFD) operation.
 - .8 Chiller efficiency at variable loads (kW/ton).
 - .9 Cooling load.
 - .10 Air and water economizer and heat recovery cycle.
 - .11 Air distribution static pressures and ventilation air volumes.
 - .12 Boiler efficiencies.
 - .13 Building-related process energy systems and equipment.
 - .14 Indoor water risers and outdoor irrigation systems.

1.5 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with division 1.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
 - .2 Operating instructions to include following:
 - .3 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .4 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .5 Safety precautions.
 - .6 Procedures to be followed in event of equipment failure.
 - .7 Other items of instruction as recommended by manufacturer of each system or item of equipment.
 - .8 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
 - .9 Post instructions where directed.
 - .10 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
 - .11 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with division 1.
- .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 from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.

- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification labels and nameplates for control items in English and French.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide equipment in accordance with Section division 1.
- .2 Equipment to be CSA certified. Where CSA certified equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: wiring and connections below 50 V which are related to control systems as specified in mechanical sections.

2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of Departmental Representative.
- .2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

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

2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with labels and/or nameplates] as follows:
 - .1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, black face, black white core, mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on labels and/or nameplates to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per label and/or nameplate.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO." as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

2.7 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 coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.8 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

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

Type	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.9 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.
- .2 Paint indoor switchgear and distribution enclosures light gray EEMAC 2Y-1.

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 Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

3.3 NAMEPLATES AND LABELS

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

3.4 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.6 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: 1400 mm.
 - .2 Wall receptacles:
 - .1 *General: 300 mm.*
 - .2 *Above top of continuous baseboard heater: 200 mm.*
 - .3 *Above top of counters or counter splash backs: 175 mm.*

- .3 In mechanical rooms: 1400 mm.
- .4 Panelboards: as required by Code or as indicated.
- .5 Telephone and interphone outlets: 300 mm.
- .6 Wall mounted telephone and interphone outlets: 1500 mm.
- .7 Fire alarm stations: 1500 mm.
- .8 Fire alarm bells: 2100 mm.
- .9 Television outlets: 300 mm.
- .10 Wall mounted speakers: 2100 mm.
- .11 Clocks: 2100 mm.
- .12 Door bell pushbuttons: 1500 mm.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.8 FIELD QUALITY CONTROL

- .1 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 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with division 1.
 - .1 Power distribution and/or generation system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm and communications.
 - .6 Insulation resistance testing:
 - .7 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .8 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .9 Check resistance to ground before energizing.

- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 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.

3.9 SYSTEM STARTUP

- .1 Instruct operating personnel and Departmental Representative in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with division 1.
 - .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 division 1.
- .3 Waste Management: separate waste materials for recycling in accordance with division 1.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION 26 05 00

PART 1 GENERAL

1.6 SUMMARY

- .1 This section includes requirements for selective demolition and removal of electrical safety and security, communications components including removal of conduit, junction boxes, and panels to a source (home run removal) and incidentals required to complete work described in this section.

1.7 REFERENCES

- .1 CSA Group (CSA)
 - .1 CSA S350 M1980, Code of Practice for Safety in Demolition of Structures

1.8 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 the Departmental 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.

1.9 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide in accordance with division 1.

- .2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.10 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this section to avoid interference with work by other sections.
- .2 Scheduling:
 - .1 Account for Departmental Representative continued occupancy requirements during selective demolition and schedule staged occupancy and worksite activities Departmental Representative.

1.11 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this section in accordance with:
 - .1 Provincial/Territorial Workers' Compensation Boards/Commissions.
 - .2 Provincial/Territorial Occupational Health and Safety Standards and Programs.

1.12 SITE CONDITIONS

- .1 Condition of materials identified as being salvaged or demolished are based on their observed condition at the time of site examination before tendering.
- .2 Discovery of Hazardous Substances:
 - .1 It is not expected that Hazardous Substances will be encountered at work. Immediately notify the Departmental Representative if materials suspected of containing hazardous substances are encountered.
- .3 Hazardous Substances:
 - .1 Hazardous Substances are present in building to be selectively demolished. A report on the presence of Hazardous Substances is attached as an information document to this specification for review and use. Examine the report to become aware of locations where hazardous materials are present—coordinate removal of hazardous materials as per appropriate sections of this specification.

1.13 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 the Departmental Representative's property.
- .2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of.

- .1 Leave main electrical distribution panel in place; panel can be used for temporary construction power for this and subsequent contracts in accordance with division 1; coordinate temporary power connections with Departmental Representative.
- .2 Leave main telephone terminal backboard in place; panel can be used for a temporary construction telephone system for this and subsequent contracts in accordance with division 1; coordinate temporary telephone connections with Departmental Representative.

PART 2 PRODUCTS

2.6 MATERIALS

- .1 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.
- .2 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.

PART 3 EXECUTION

3.6 EXAMINATION

- .1 Verification of Existing Conditions:
- .2 Visit the site, thoroughly examine and become familiar with conditions that may affect the work of this section before tendering the Bid.
- .3 Departmental 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.

3.7 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 Departmental Representative and cease operations where the 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 Departmental Representative and users is minimized and as follows:
 - .1 Prevent debris from endangering safe access to and egress from occupied buildings.
 - .2 Notify Departmental Representative and cease operations where the safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this section.

3.8 EXECUTION

- .1 Coordinate requirements of this section as follows:
 - .1 Disconnect electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent work.
- .2 Remove existing luminaires, electrical devices and equipment, including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
- .3 Disconnect and remove the existing fire alarm system, including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
- .4 Disconnect and remove communication systems, including associated conduits, boxes, cabling, and similar items unless specifically noted otherwise.
- .5 Disconnect and remove telephone outlets, associated conduit, cabling and subterminal backboards and related accessories; maintain telephone service and main terminal backboard as is.
- .6 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove tools or equipment after completion of work, and leave the site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of the work of this section to match existing materials and finishes.
- .7 Disconnect panel feeders back to the main distribution panel and re-label respective circuit breaker as "SPARE."
- .8 Place weatherproof blank cover plates on exterior outlet boxes remaining after demolition and removal activities.
- .9 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.

- .10 Grind off conduits and make flush with the surface of the concrete where conduits are cast into concrete; seal open ends of conduits with silicone sealant and leave in place.
- .11 Seal open ends of conduit with silicone sealant and leave in a place where they are inaccessible or cannot be removed without damaging adjacent construction.

3.9 CLOSEOUT ACTIVITIES

- .1 Arrange for legal disposal and remove demolished materials to an accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for reuse in new construction.

END OF SECTION 26 05 05

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

- .1 CSA International
 - .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMJ-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with division 1.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 *Submit project Waste Management Plan highlighting recycling and salvage requirements.*

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with division 1.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with division 1 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 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with division 1.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper 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 copper conductors.
 - .2 Clamp for a copper bar.
 - .3 Stud clamp bolts.
 - .4 Bolts for a copper bar.
 - .5 Sized for conductors and bars, as indicated.
- .4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:

- .1 Install mechanical pressure type connectors and tighten screws. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
- .2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
- .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with division 1.
 - .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 division 1.
- .3 Waste Management: separate waste materials for reuse and/or recycling in accordance with division 1.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION 26 05 20

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.
- .2 Refer to drawings for wiring type required under different applications.

1.2 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA).
 - .1 CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.
 - .2 CAN/CSA-C22.2 No. 131, Type TECK 90 Cable.

1.3 PRODUCT DATA

- .1 Provide product data in accordance with division 1.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse by manufacturer and return of crates, padding, packaging materials, pallets in accordance with division 1.

PART 2 PRODUCTS

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper and ACM alloy conductors: size as indicated, with 600 insulation of cross-linked thermosetting polyethylene material rated RWU90 XLPE and/or RW90 XLPE, Jacketted and/or Non Jacketted.
- .3 Copper conductors: size as indicated, with thermoplastic insulation type TWH rated at 600 V.
- .4 Neutral supported cable: 1,2 or 3 phase insulated conductors of copper and one neutral conductor of copper steel reinforced, size as indicated. Type: NS75/NS90 Insulation: Type NSF-2 flame retardant rated 600 V.

2.2 TECK 90 CABLE

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: ACM alloy and copper, size as indicated.

- .3 Insulation:
 - .1 Cross-linked polyethylene XLPE.
 - .2 Rating: 1000 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking aluminum.
- .6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .7 Fastenings:
 - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
 - .2 Channel type supports for two or more cables at
 - .3 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
 - .1 Watertight approved for TECK cable.

2.3 MINERAL-INSULATED CABLES

- .1 Conductors: solid bare soft-annealed copper, size as indicated.
- .2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.
- .3 Outer covering: annealed seamless copper sheath, Type M1 rated 600 V, 250 degrees C.
- .4 Overall jacket: PVC applied over the sheath and compliant to applicable Building Code classification for this project, wet locations, direct burial.
- .5 Two hour fire rating.
- .6 Connectors: watertight, field installed] [factory installed and tested approved for MI cable.
- .7 Termination kits: field installed approved for MI cable

2.4 ARMOURED CABLES

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from aluminum strip.
- .4 Type: PVC flame retardant jacket over thermoplastic armour and compliant to applicable Building Code classification for this project wet locations.
- .5 Connectors: anti short connectors.

2.5 ALUMINUM SHEATHED CABLE

- .1 Conductors: copper and ACM alloy, size as indicated.
- .2 Insulation: cross linked polyethylene type RA90 rated 1000 V.
- .3 Sheath: aluminum applied to form continuous seamless sheath.
- .4 Outer jacket: thermoplastic applied over sheath and to be compliant to applicable Building Code classification for this project, wet locations, direct burial.
- .5 Fastenings for aluminum sheathed cable:
 - .1 One hole steel straps to secure surface cables 25 mm and smaller. Two hole steel straps for cables larger than 25 mm. Use aluminum strap only with single conductor cable.
 - .2 Channel type supports for two or more cables at 1500 mm centers.
 - .3 Threaded rods: 6 mm diameter to support suspended channels.

2.6 CONTROL CABLES

- .1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath: thermoplastic jacket.
- .2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated
LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: PVC polyethylene TW.
 - .2 Shielding: tape coated with paramagnetic material over each conductor.
 - .3 Overall covering: PVC jackets.

2.7 NON-METALLIC SHEATHED CABLE

- .1 Non-metallic sheathed copper cable type: NMD90 nylon], size as indicated.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

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

3.2 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- .7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

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

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

- .1 Group cables wherever possible on channels.
- .2 Install cable concealed, securely supported by hangers and straps.

3.5 INSTALLATION OF MINERAL-INSULATED CABLES

- .1 Install cable exposed, securely supported by straps.
- .2 Support 2 hour fire rated cables at 1 m intervals.
- .3 Make cable terminations by using factory-made kits.
- .4 Cable terminations: use thermoplastic sleeving over bare conductors.
- .5 Where cables are buried in cast concrete or masonry, sleeve for entry and exit of cables.
- .6 Do not splice cables unless indicated.

3.6 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible on channels.

3.7 INSTALLATION OF ALUMINUM SHEATHED CABLE

- .1 Group cables wherever possible on channels.

3.8 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit, as indicated.
- .2 Ground control cable shield.

3.9 INSTALLATION OF NON-METALLIC SHEATHED CABLE

- .1 Install cables.
- .2 Install straps and box connectors to cables as required.

END OF SECTION 26 05 21

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with division 1.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - a) Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with division 1.
- .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 hangers and supports from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to work of this section.

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or set in poured concrete walls and ceilings.

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 hangers and supports installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.

- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Secure equipment to 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 channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .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 diameter threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 3 m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with division 1.
 - .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 division 1.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with section 01 00 10 - General instruction.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION 26 05 29

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1, 20th Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with division 1.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with division 1.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for recycling and/or reuse in accordance with division 1.

PART 2 PRODUCTS

2.1 SPLITTERS

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat covers.

2.3 CABINETS

- .1 Construction: welded sheet steel hinged door, handle, lock 2 keys latch and catch

- .2 Type E Empty: surface return flange mounting as indicated.
- .3 Type T Terminal: surface return flange mounting as indicated containing sheet steel 19 mm plywood backboard.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

- .1 Mount plumb, true and square to building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 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 except where indicated otherwise.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

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

END OF SECTION 26 05 31

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results – Electrical.
- .2 Section 26 05 29 – Hangers and Supports for Electrical Systems
- .3 Section 26 05 34 – Conduits, Conduit Fastenings and Fittings.

1.2 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1, 20th Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with division 1.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance division 1.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling and/or reuse in accordance with division 1.

PART 2 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

- .5 Extension and plaster rings for flush mounting devices in finished plaster 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-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 FLOOR BOXES

- .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass faceplate. Device mounting plate to accommodate short or long ear duplex receptacles. Minimum depth: 73 mm for receptacles and communication outlets.
- .2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 16, 21 and 27 mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

- .1 Cast FD or FS aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.7 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.

2.8 FITTINGS - GENERAL

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

2.9 SERVICE FITTINGS

- .1 'High tension' receptacle fitting made of two (2) piece die-cast aluminum with brushed aluminum housing finish for one (1) duplex receptacles. Bottom plate with two knockouts for centered or offset installation. 12 x 102 mm extension piece as indicated.
- .2 Pedestal type 'low tension' fitting made of 2 piece die cast aluminum with brushed aluminum housing finish to accommodate two Amphenol jack connectors.

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. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION 26 05 32

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section division 1
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling and/or reuse in accordance with Section division 1
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 PRODUCTS

2.1 CABLES AND REELS

- .1 Provide cables on reels or coils.
 - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.
- .4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, aluminum liquid-tight flexible metal.
- .6 FRE conduit: to CSA C22.2.
- .7 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3

2.3 CONDUIT FASTENINGS

- .1 One hole [malleable iron] [steel] straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.5 m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

- .1 Polypropylene.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .3 Surface mount conduits except in finished areas or as indicated.
- .4 Use rigid hot dipped galvanized steel threaded conduit except where specified otherwise.
- .5 Use epoxy coated conduit underground in corrosive areas.
- .6 Use electrical metallic tubing (EMT) except in cast concrete and above 2.4 m not subject to mechanical injury.
- .7 Use rigid PVC conduit in corrosive areas and underground.
- .8 Use flexible metal conduit for connection to motors in dry areas connection to recessed incandescent fixtures without a prewired outlet box connection to surface or recessed fluorescent fixtures work in movable metal partitions.
- .9 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .10 Use explosion proof flexible connection for connection to explosion proof motors.
- .11 Install conduit sealing fittings in hazardous areas.
 - .1 Fill with compound.
- .12 Minimum conduit size for lighting and power circuits: 21 mm.
- .13 Install EMT conduit from computer room branch circuit panel to outlet boxes located in sub floor.
- .14 Install EMT conduit from computer room branch circuit panel to junction box in sub-floor immediately below panel.
 - .1 Run flexible conduit from junction box to outlet boxes for each computer in sub-floor.
- .15 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .16 Mechanically bend steel conduit over 19 mm diameter.

- .17 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .18 Install fish cord in empty conduits.
- .19 Run 2-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel.
 - .1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete type box.
- .20 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .21 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

- .1 Locate to suit reinforcing steel.
 - .1 Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.
 - .1 Use cold mastic between sleeve and conduit.
- .5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

- .1 Run conduits 25 mm and larger below slab and encase in 75 mm concrete envelope.
 - .1 Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.8 CLEANING

- .1 Proceed in accordance with division 1.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION 26 05 34

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 00 10 - General instruction.
- .2 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
 - .2 ANSI C82.4, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
 - .1 ASTM F1137, Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA International)
- .5 ICES-005, Radio Frequency Lighting Devices.
- .6 Underwriters' Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with division 1.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review and/or approval by Departmental Representative.
 - .3 Photometric data to include: VCP Table where applicable and spacing criterion.
- .3 Quality assurance submittals: provide following in accordance with division 1.
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.4 QUALITY ASSURANCE

- .1 Provide mock-ups in accordance with division 1.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with division 1.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Divert unused metal materials from landfill to metal recycling facility.
- .4 Disposal and recycling of fluorescent lamps as per local regulations.
- .5 Disposal of old PCB filled ballasts.

PART 2 PRODUCTS

2.1 LAMPS

- .1 Incandescent lamps to be - clear, A19, 100 Watt with 1000 hour lamp life, rough-service rated; or as indicated.
- .2 Tungsten halogen lamps to be - clear, T-3, 300 Watt, RSC base, 2000 hour lamp life, 5000 lumens; or as indicated.
- .3 Fluorescent lamps to be - T8, 32 Watt, medium bi-pin, rapid-start, 4100 K, 30,000 hour lamp life, 2950 initial lumens, CRI 80; or as indicated.
- .4 Metal halide lamps to be - clear, BT37, 400 Watt, mogul base, horizontal burn, 4100 K, 15,000 hour lamp life, 36,000 initial lumens, CRI 65, open or enclosed type to suit the luminaire; or as indicated.
- .5 Low pressure sodium lamps to be - clear, T21, 135 Watt, BY22d base, horizontal burn, 16,000 hour lamp life, 22,000 initial lumens; or as indicated.
- .6 High pressure sodium lamps to be - clear, ED18, 400 Watt, mogul base, 30,000 hour lamp life, 54,000 initial lumens; or as indicated.
- .7 Compact fluorescent lamps to be - 18 Watt, G24q-2 base, 12,000 hour lamp life, 12,000 initial lumens, 4100 K, CRI 80; or as indicated.

2.2 BALLASTS

- .1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic.
 - .1 Rating: voltage as indicated, 60 Hz, for use with 2-32W, rapid start lamps.
 - .2 Totally encased and designed for 40 degrees Celsius ambient temperature.
 - .3 Power factor: minimum 98 % with 98% of rated lamp lumens.
 - .4 Current crest factor: 1.5 maximum.
 - .5 Harmonics: 10 % maximum THD.
 - .6 Operating frequency of electronic ballast: 20 kHz minimum.
 - .7 Total circuit power: 62 Watts.
 - .8 Ballast factor: greater than 0.90.

- .9 Sound rated: Class A.
- .10 Mounting: integral with luminaire.
- .2 Metal halide ballast design B:
 - .1 Rating: voltage as indicated, 60 Hz, for use with 1-400W metal halide lamp. Provide circuitry for quartz re-strike standby light where indicated.
 - .2 Totally encased and designed for 40 degrees Celsius ambient temperature.
 - .3 Power factor: minimum 95 % with 95% of rated lamp lumens.
 - .4 Type: solid state or constant wattage autotransformer.
 - .5 Input voltage range: plus or minus 10% of nominal.
 - .6 Minimum starting temperature: minus 30 degrees Celsius at 90% line voltage.
 - .7 Mounting: indoor and/or outdoor, integral with luminaire.
 - .8 Current crest factor: 1.7 maximum current.
- .3 High pressure sodium ballast: to ANSI C82.4 design C.
 - .1 Rating: voltage as indicated, 60Hz, for use with 1-400W high pressure sodium lamp.
 - .2 Totally encased and designed for 40 degrees Celsius ambient temperature.
 - .3 Power factor: minimum 95 % with 95% of rated lamp lumens.
 - .4 Type: reactor or solid state with matching ignitor as recommended by manufacturer.
 - .5 Input voltage range: plus 10% to minus 10% of nominal.
 - .6 Minimum starting temperature: minus 40 degrees Celsius at 90% line voltage.
 - .7 Mounting: integral with luminaire, outdoor.
 - .8 Current crest factor: 1.7 maximum current.
- .4 Low pressure sodium ballast design D:
 - .1 Rating: voltage as indicated, 60 Hz, for use with 1-35W low pressure sodium lamp.
 - .2 Totally encased and designed for [40] degrees Celsius ambient temperature.
 - .3 Power factor: minimum 95 % with 95% of rated lamp lumens.
 - .4 Type: constant wattage.
 - .5 Input voltage range: plus or minus 20% of nominal.
 - .6 Minimum starting temperature: minus 34 degrees Celsius at 90% line voltage.
 - .7 Mounting: outdoor integral with luminaire.

2.3 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.5 LUMINAIRES

- .1 As indicated in luminaire schedule.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires from ceiling grid in accordance with local inspection requirements.

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

- .1 Clean in accordance with Section division 1.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling and/or reuse in accordance with division 1.

END OF SECTION 26 50 00



Designated Substance Report L'Esplanade Laurier Parking Garage Structural Repairs, 300 Laurier Avenue West, Ottawa, Ontario

2019-11-26

**Environment, Health and Safety
Real Property Services
Public Services and Procurement Canada**

**Prepared for: Ken Johnson
Project Management Consultant
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1 Introduction

The Custodial Health and Safety Unit (CHSU) of Public Services and Procurement Canada (PSPC) was retained by Ken Johnson, Project Management Consultant with the Project Management Service Line, to prepare a project-specific evaluation of designated substances for structural repairs in the parking garage of L'Esplanade Laurier, Ottawa, Ontario.

The evaluation included the assessment of the project area for the presence of the following 11 designated substances listed in *Designated Substances*, Ontario Regulation (O Reg) 490/09:

- acrylonitrile;
- arsenic;
- asbestos;
- benzene;
- coke oven emissions;
- ethylene oxide;
- isocyanates;
- lead;
- mercury;
- silica; and
- vinyl chloride.

Other hazardous materials which are not classified as designated substances but were included as part of the evaluation include:

- Polychlorinated Biphenyls (PCBs);
- Halocarbons; and
- Mould.

2 Regulatory Requirements

According to the *Canada Labour Code*, RSC 1985, c L-2 s 124, the employer has a general duty to ensure that the health and safety of employees is protected. Section 125 of the *Code* requires the employer to inform anyone granted access to a work area of the known or foreseeable health and safety hazards they are likely to be exposed to in the workplace. This Designated Substance Report (DSR) is a tool to inform employees and contractors of the known or foreseeable designated substances in the work area that may require special precautions.

Additionally, *Occupational Health and Safety Act*, RSO 1990, c O.1, s 30 requires that a project owner identify designated substances on projects and provide a list of designated substances that may be present in the work area to prospect constructors as part of the tendering information.

The *Canada Labour Code*, *PSPC Asbestos Management Standard*, and *Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations*, O Reg 278/05 also require that workers be informed of all asbestos-containing materials known or likely to be present in the work area before work commences, so that appropriate work precautions can be adopted.

3 Project Description

The scope of the project that is the subject of this DSR is structural repairs such as through-slab repair and shoring, as well as expansion joint and waterproofing repair. The project also includes exploratory openings in columns.

4 Methodology

The on-site survey for this report was conducted by CHSU on August 25th, 2019. No other areas outside the defined work boundaries were assessed at that time. In addition to the field work, existing asbestos management plans and DSRs completed in the space were consulted where applicable.

The onsite survey consisted of a visual inspection of the project area and collecting samples of readily available materials. The survey was non-destructive as agreed upon with the project manager. A total of 16 bulk samples of suspected asbestos-containing materials and 1 sample of suspected lead-containing surface coating were collected from the project areas and analyzed by Paracel Laboratories Ltd., a

laboratory accredited through the Canadian Association for Laboratory Accreditation (CALA) and the National Voluntary Laboratory Accreditation Program (NVLAP).

The asbestos analysis was completed using Polarized Light Microscopy (PLM) in accordance with U.S. EPA Method 600/R-93/116.

The lead analysis was completed using Inductively Coupled Plasma – Optometric Emission Spectrometry (ICP-OES) in accordance with U.S. EPA Method 6010-C.

5 Findings

5.1 Asbestos

Table 1 below presents the findings of samples collected from the project areas that were analyzed for asbestos content.

Table 1: Results of samples analyzed by PLM to determine asbestos content

Sample ID	Location	Material	Asbestos type and content	Friability	Figure/ Photo #
LEL-P1-EJ-1A-1C	P1 East – Wall near parking kiosk	Expansion joint glue	2% chrysotile	Non-Friable	Figure 1
LEL-P2-Cement-1A, 2A, 3A, 3B, 3C, 4A	Throughout P1, P2, and P3 – ceiling and floor around columns	Cement compound	n/d	na	Photo 1
LEL-P2-PR-1A, LEL-P3-PR-1A, 1B, 1C, 2A, 3A, 4A	Throughout P1, P2, and P3 – Applied on drain pipe fittings and surrounding ceiling	Parging cement compound	n/d	na	Photo 2

n/a = not applicable; n/d = none detected; **bold items denotes asbestos-containing material.**

Expansion joint glue was found to be asbestos containing. Cement compound and parging cement compound was found to be non-asbestos containing.

5.2 Lead

Table 1 below presents the findings of bulk samples collected from the project area that were analyzed for lead content.

Table 1: Results of surface coating samples analyzed for lead content by ICP-OES

Sample ID	Description	Location	Lead Content (ppm)
LEL-P2-FloorCoating-1A	Floor waterproofing coating	Floors throughout P1, P2, and P3	<20

Based on the above results, the lead-content in waterproofing coating is below the method detection limit of 20ppm and is therefore considered non-lead containing.

Lead is assumed to be present in solder on the joints of copper piping; and joint packings of drainpipes.

5.3 Mercury

Mercury is suspected within fluorescent light tubes in the project area. Fluorescent light tubes are not anticipated to be impacted by the project.

5.4 Silica

Silica is present in the concrete, cement compound, parging cement compound, and cement within the project area.

5.5 Polychlorinated Biphenyls (PCBs)

During the site investigation, fluorescent light fixtures were observed in the project areas. The ballasts associated with these light fixtures are suspected to contain PCBs, unless proven otherwise. PCB's are not anticipated to be impacted by the project.

5.6 Designated Substances / Hazardous Materials Not Identified

The following designated substances or hazardous materials were neither observed nor suspected in the project area:

- acrylonitrile;
- arsenic;
- benzene;
- coke oven emissions;
- ethylene oxide;
- halocarbons;
- isocyanates;
- vinyl chloride, and
- mould.

6 Conclusions and Recommendations

6.1 Asbestos

Expansion joint glue was found to be asbestos containing.

If asbestos containing expansion joint compound is to be removed via handheld tools while the material is kept adequately wet, low risk (type 1) precautions must be used at a minimum.

If asbestos containing expansion joint compound is to be removed via power tools equipped with a working HEPA filter, moderate risk (type 2) precautions must be used at a minimum.

If asbestos containing expansion joint compound is to be removed via power tools not equipped with a working HEPA filter, high risk (type 3) precautions must be used at a minimum.

The disturbance of asbestos-containing materials on construction and demolition projects is governed by the *Canada Occupational Health and Safety Regulations*, SOR/86-304, *PSPC Asbestos Management Standard*, and in the province of Ontario by O Reg 278/05. These regulations and standard classify all asbestos disturbance as Low Risk (Type 1), Moderate Risk (Type 2), or High Risk (Type 3), each of which has defined precautionary measures. All asbestos materials are subject to specific handling and disposal precautions. In the event of conflict between requirements, the more stringent procedures apply.

Waste containing asbestos must be managed in compliance with *General – Waste Management*, RRO 1990, Reg 347.

6.2 Lead

Lead-content of the waterproofing coating is below the method detection limit of 20ppm and is therefore considered non-lead containing.

6.3 Silica

Silica is present in the concrete, cement compound, parging cement compound, and cement within the project area.

The Ontario Ministry of Labour has published the document entitled *Guideline: Silica on Construction Projects*. This document classifies the disturbance of materials containing silica as Type 1, Type 2 or Type

3 work, and assigns different levels of respiratory protection and work procedures for each classification. These procedures should be followed when performing work involving the disturbance of silica-containing materials.

7 Limitation of report

The visual inspection and sampling was limited to readily accessible areas. Should any additional materials suspected of containing designated substances be encountered during the course of work, work shall be stopped, precautionary measures taken, and the Departmental Representative notified immediately. Do not proceed until written instructions have been received.

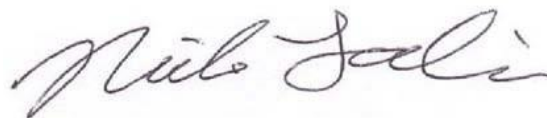
This final report titled:

**Designated Substance Report
L'Esplanade Laurier Parking Garage Structural Repairs,
300 Laurier Avenue West, Ottawa, Ontario**

2019-11-26

has been prepared and reviewed by

Report author



Nick Tobin / 2019-11-26

Primary reviewer



Cyprien Amani / 2019-11-29

Secondary reviewer



Crystel Marly Arseneault / 2019-11-29

**Custodial Health and Safety Unit
Environment, Health and Safety
Technical Services
Real Property Services**

APPENDIX A
Figures and Photos

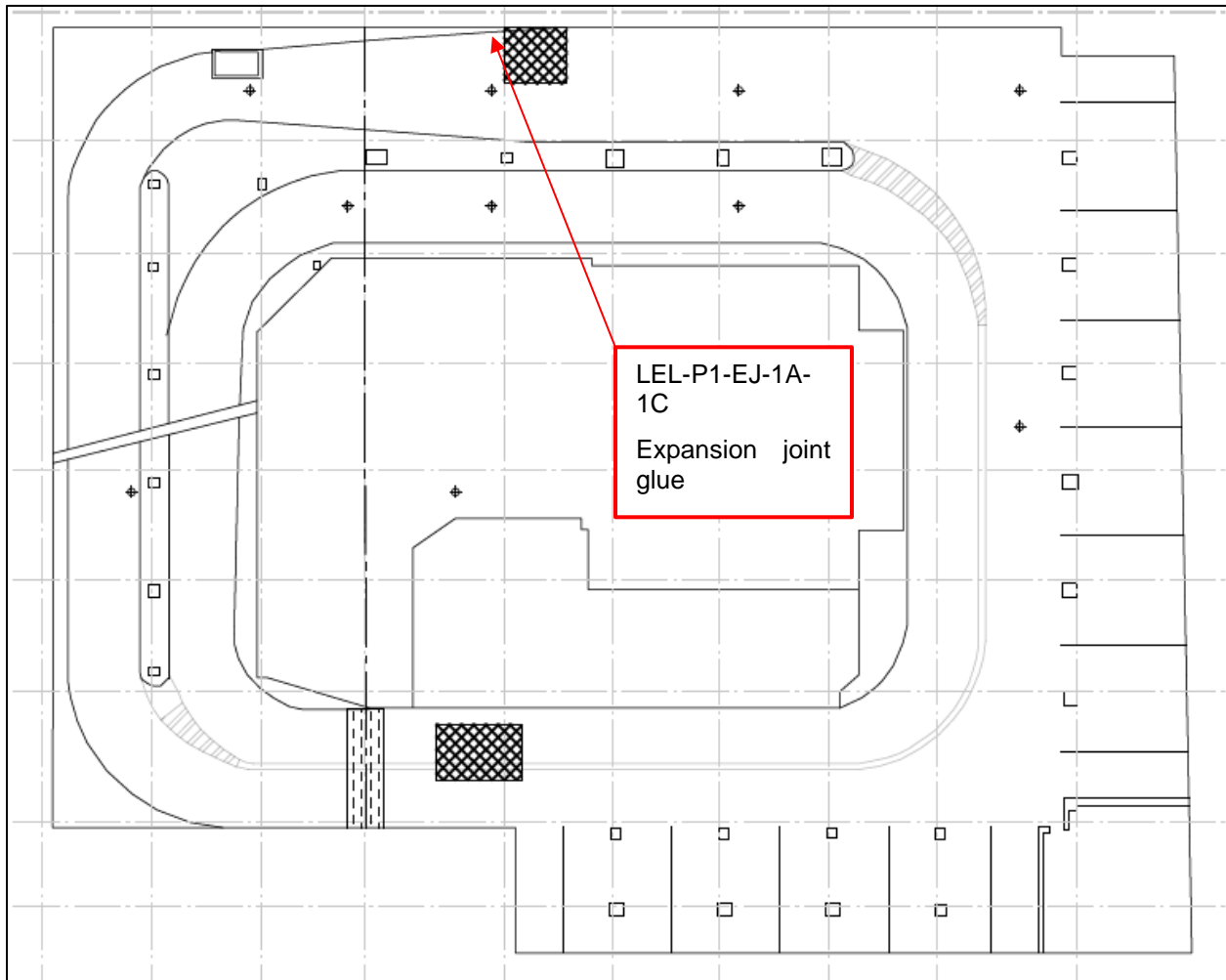


Figure 1. Sample location of asbestos containing expansion joint glue. P1 parking garage.



Photo 1. Non-asbestos containing cement parging near former drain pipe.



Photo 2. Non-asbestos containing cement compound near a column. Cement compound is troweled on to bottom of pipe.

APPENDIX B
Laboratory Certificates of Analysis

Certificate of Analysis

PWGSC (Riverside)

2720 Riverside, A-425-B

Ottawa, ON K1A 0S5

Attn: Nick Tobin

Client PO: 700436834

Project: HAZ19-79

Custody:

Report Date: 22-Nov-2019

Order Date: 18-Nov-2019

Order #: 1947099

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID Client ID

1947099-01 LEL-P2-FloorCoating-1A

Approved By:



Dale Robertson, BSc
Laboratory Director

Any use of these results implies your agreement that our total liability in connection with this work, however arising shall be limited to the amount paid by you for this work, and that our employees or agents shall not under circumstances be liable to you in connection with this work

Certificate of Analysis
Client: PWGSC (Riverside)
Client PO: 700436834

Report Date: 22-Nov-2019
Order Date: 18-Nov-2019
Project Description: HAZ19-79

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Metals, ICP-OES	based on MOE E3470, ICP-OES	21-Nov-19	22-Nov-19

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Certificate of Analysis
 Client: PWGSC (Riverside)
 Client PO: 700436834

Report Date: 22-Nov-2019
 Order Date: 18-Nov-2019
 Project Description: HAZ19-79

Sample Results

Lead				Matrix: Paint
				Sample Date: 13-Nov-19
Paracel ID	Client ID	Units	MDL	Result
1947099-01	LEL-P2-FloorCoating-1A	ug/g	20	<20

Laboratory Internal QA/QC

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Matrix Blank									
Lead	ND	20	ug/g						
Matrix Duplicate									
Lead	ND	20	ug/g	ND			0.0	30	
Matrix Spike									
Lead	242		ug/L	ND	95.3	70-130			



Client Name: psgc	Project Reference: HAZ19-79	Turnaround Time: <input checked="" type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: Nick Tobin	Quote #	
Address: 2720 Riverside Drive, Ottawa, Ontario K1A 0S5	PO #	
Telephone: 613-736-2914	Email Address: nick.tobin@psgc-psgsc.gc.ca	

Criteria: ☐ O. Reg. 153/04 (As Amended) Table ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Parcel Order Number:		Matrix	Air Volume	# of Containers	Sample Taken		Lead in paint												
Sample ID/Location Name					Date	Time													
1	LEL-P2-FloorCoating-1A	Paint			11/13/2019		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments:

Method of Delivery:

Swift

Relinquished By (Sign): <i>[Signature]</i>	Received by Driver/Depot:	Recorded at Lab: <i>[Signature]</i>	Verified By: <i>[Signature]</i>
Relinquished By (Print): Nick Tobin	Date/Time:	Date/Time: Nov 13 2019 / 15:13	Date/Time: Nov 16 2019 / 15:13
Date/Time: 11/14/2019	Temperature: _____ °C	Temperature: _____ °C	pH Verified By: <i>[Signature]</i>

Certificate of Analysis

PWGSC (Riverside)

2720 Riverside, A-425-B
Ottawa, ON K1A 0S5
Attn: Nick Tobin

Client PO: 700419274

Project: HAZ19-79

Custody:

Report Date: 21-Nov-2019

Order Date: 18-Nov-2019

Order #: 1947161

This Certificate of Analysis contains analytical data applicable to the following samples as submitted :

Paracel ID	Client ID
1947161-01	LEL-P1-EJ-1A
1947161-02	LEL-P2-Cement-1A
1947161-03	LEL-P2-Cement-2A
1947161-04	LEL-P2-Cement-3A
1947161-05	LEL-P2-Cement-3B
1947161-06	LEL-P2-Cement-3C
1947161-07	LEL-P2-Cement-4A
1947161-08	LEL-P2-PR-1A
1947161-09	LEL-P3-PR-1A
1947161-10	LEL-P3-PR-1B
1947161-11	LEL-P3-PR-1C
1947161-12	LEL-P3-PR-2A
1947161-13	LEL-P3-PR-3A
1947161-14	LEL-P3-PR-4A
1947161-15	LEL-P1-EJ-1B
1947161-16	LEL-P1-EJ-1C

Approved By:



Heather S.H. McGregor, BSc

Laboratory Director - Microbiology

Certificate of Analysis
Client: **PWGSC (Riverside)**
Client PO: **700419274**

Report Date: 21-Nov-2019
Order Date: 18-Nov-2019
Project Description: **HAZ19-79**

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Parcel ID	Sample Date	Colour	Description	Asbestos Detected	Material Identification	% Content
1947161-01	13-Nov-19	Off-white	Expansion Joint Glue	Yes	Client ID: LEL-P1-EJ-1A	
					Chrysotile	2
					Non-Fibers	98
1947161-02	13-Nov-19	Grey	Cement	No	Client ID: LEL-P2-Cement-1A	
					Non-Fibers	100
1947161-03	13-Nov-19	Grey	Cement	No	Client ID: LEL-P2-Cement-2A	
					Non-Fibers	100
1947161-04	13-Nov-19	Grey	Cement	No	Client ID: LEL-P2-Cement-3A	
					Non-Fibers	100
1947161-05	13-Nov-19	Grey	Cement	No	Client ID: LEL-P2-Cement-3B	
					Non-Fibers	100
1947161-06	13-Nov-19	Grey	Cement	No	Client ID: LEL-P2-Cement-3C	
					Non-Fibers	100
1947161-07	13-Nov-19	Grey	Cement	No	Client ID: LEL-P2-Cement-4A	
					Non-Fibers	100
1947161-08	13-Nov-19	Grey	Cement	No	Client ID: LEL-P2-PR-1A	
					Non-Fibers	100
1947161-09	13-Nov-19	Brown	Leveling Compound	No	Client ID: LEL-P3-PR-1A	
					Non-Fibers	100
1947161-10	13-Nov-19	Brown	Leveling Compound	No	Client ID: LEL-P3-PR-1B	
					Non-Fibers	100
1947161-11	13-Nov-19	Grey	Cement	No	Client ID: LEL-P3-PR-1C	
					Non-Fibers	100
1947161-12	13-Nov-19	Grey	Cement	No	Client ID: LEL-P3-PR-2A	
					Non-Fibers	100

Certificate of Analysis
Client: PWGSC (Riverside)
Client PO: 700419274

Report Date: 21-Nov-2019
 Order Date: 18-Nov-2019
Project Description: HAZ19-79

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Parcel ID	Sample Date	Colour	Description	Asbestos Detected	Material Identification	% Content
1947161-13	13-Nov-19	Grey	Cement	No	Client ID: LEL-P3-PR-3A	
					Non-Fibers	100
1947161-14	13-Nov-19	Grey	Cement	No	Client ID: LEL-P3-PR-4A	
					Non-Fibers	100
1947161-15	13-Nov-19	Off-white	Expansion Joint Glue	Yes	Client ID: LEL-P1-EJ-1B	
					Chrysotile	2
					Non-Fibers	98
1947161-16	13-Nov-19	Off-white	Expansion Joint Glue	Yes	Client ID: LEL-P1-EJ-1C	
					Chrysotile	2
					Non-Fibers	98

**** Analytes in bold indicate asbestos mineral content.**

Analysis Summary Table

Analysis	Method Reference/Description	Lab Location	NVLAP Lab Code	*	Analysis Date
Asbestos, PLM Visual Estimation	by EPA 600/R-93/116	2 - Ottawa West Lab	200812-0		21-Nov-19

* Reference to the NVLAP term does not permit the user of this report to claim product certification , approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Ottawa West Lab: 25 Northside Rd, Unit C Nepean, Ontario K2H 8S1

Work Order Revisions | Comments

None



TRUSTE
RESPON
RELIABLE.

Paracel ID: 1947161



paracel@paracellabs.com

Chain of Custody
(Lab Use Only)

Page 1 of 1

Client Name: PSPC	Project Reference: HAZ19-79	Turnaround Time: <input type="checkbox"/> Immediate <input type="checkbox"/> 1 Day <input type="checkbox"/> 4 Hour <input type="checkbox"/> 2 Day <input type="checkbox"/> 8 Hour <input type="checkbox"/> 3 Day <input checked="" type="checkbox"/> Regular
Contact Name: Nick Tobin	Quote #:	
Address: 2720 Riverside Drive, Ottawa, Ontario K1A 0S5	PO #:	
Telephone: 613-736-2914	Email Address: nick.tobin@tpsgc-pwgsc.gc.ca	
Date Required:		

ASBESTOS & MOLD ANALYSIS

Matrix: ☐ Air ☒ Bulk ☐ Tape Lift ☐ Swab ☐ Other Regulatory Guideline: ☒ ON ☐ QC ☐ AB ☐ SK ☐ Other:

Analysis: ☐ Microscopic Mold ☐ Culturable Mold ☐ Bacteria GRAM ☐ PCM Asbestos ☒ PLM Asbestos ☐ Chatfield Asbestos ☐ TEM Asbestos

Parcel Order Number:		Sampling Date	Air Volume (L)	Analysis Required	Asbestos - Bulk		
Sample ID					Identify Distinct Building Materials to Be Analyzed	Combine Identified Materials?	Positive Stop?
					<div>* see below</div>	**see below	
1	LEL-P1-EJ-1A	11/13/2019			Expansion Joint Glue	<input type="checkbox"/>	<input type="checkbox"/>
2	LEL-P2-Cement-1A	11/13/2019			Cement	<input type="checkbox"/>	<input type="checkbox"/>
3	LEL-P2-Cement-2A	11/13/2019			Concrete	<input type="checkbox"/>	<input type="checkbox"/>
4	LEL-P2-Cement-3A to C	11/13/2019			Cement	<input type="checkbox"/>	<input type="checkbox"/>
5	LEL-P2-Cement-4A	11/13/2019			Cement	<input type="checkbox"/>	<input type="checkbox"/>
6	LEL-P2-PR-1A	11/13/2019			Parging	<input type="checkbox"/>	<input type="checkbox"/>
7	LEL-P3-PR-1A to C	11/13/2019			Parging	<input type="checkbox"/>	<input type="checkbox"/>
8	LEL-P3-PR-2A	11/13/2019			Parging	<input type="checkbox"/>	<input type="checkbox"/>
9	LEL-P3-PR-3A	11/13/2019			Parging	<input type="checkbox"/>	<input type="checkbox"/>
10	LEL-P3-PR-4A	11/13/2019			Parging	<input type="checkbox"/>	<input type="checkbox"/>
11						<input type="checkbox"/>	<input type="checkbox"/>
12						<input type="checkbox"/>	<input type="checkbox"/>

* If left blank, Paracel will analyze all materials identified during analysis ** If left blank, Paracel will analyze all materials as individual samples (at additional cost) per EPA 600/R-93/116

Comments:		Method of Delivery: <i>Swift</i>	
Relinquished By (Sign): <i>[Signature]</i>	Received at Depot: <i>[Signature] (not able to sign)</i>	Received at Lab: <i>[Signature]</i>	Verified By: <i>[Signature]</i>
Relinquished By (Print): Nick Tobin	Date/Time: Nov 18/19 3:34	Date/Time: Nov 19/19 10:14	Date/Time: 11/19/19 11:02 am