SPECIFICATION

St. Lewis Satellite Office & Warehouse
Waterline Upgrade
St. Lewis, NL
P/N: F6879-169203

ISSUED FOR TENDER

ENGINEERING CONSULTANT
Crosbie Engineering Limited
21 Mews Place
St. Johns, NL A1B 4A5

DATE

August 4, 2016

MECHANICAL PERMIT

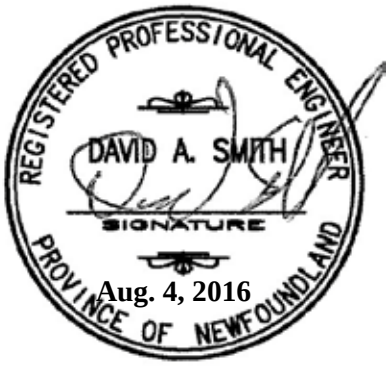
PROVINCE OF NEWFOUNDLAND

PERMIT HOLDER
Class "A"
This Permit Allows

CROSBIE ENGINEERING LIMITED

To practice Professional Engineering
in Newfoundland and Labrador
Permit No. as issued by PEG–NL D0123
which is valid for the year 2016.

MECHANICAL STAMP



Aug. 4, 2016

M-1 Site Plan
M-2 Details

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 St. Lewis Satellite Office and Warehouse Waterline Upgrade, St. Lewis, NL.

.2 Contractor use of premises.

.3 Owner occupancy.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

1. The St. Lewis Satellite Office & Warehouse (Category 1 Office; DFRP# 58590) is a DFO-custodial facility located at 10 Shoal Point Road in the community of St. Lewis on the southeast coast of Labrador. The facility consists of a DFO Conservation & Protection Satellite Office (constructed in 1982), attached operational storage garage (2007), storage shed (2004), two above-ground fuel storage tanks, fenced compound, septic tank & disposal field, and a private artesian well.

   The artesian well does not supply a quality of water that is acceptable to the tenants.

   This project is to supply and install a municipal grade watermain that will connect to the existing town watermain approximately 500m away and be routed to and connect to the Satellite Office and Warehouse. The proposed line and route is shown on the plans.

   The watermain will connect to the town main in the general vicinity shown on the plans, and be installed generally in a service ditch to be constructed adjacent to or below the existing roadway and the line will be brought in the ditch to the DFO office. The ditch would need to be at least 2.5m deep by 1m wide. Some blasting would need to occur to construct the ditch. The waterline will need a minimum 2m cover to protect it from freezing.

   A curbstop valve will need to be installed where the pipe connects to the town main, and also another outside the DFO building. A new above grade hydrant will also be installed near the DFO building as indicated on the plans. The watermain would also be brought inside the DFO building under the footing and be connected to the building domestic water system including the installation of a main shut-off valve and backflow prevention inside the building.

.2 Contractor shall be in good standing with WHSCC.

.3 Site visit is mandatory before tender closing. Exact time will be coordinated by DFO during tender period.

.4 Work in this contract comprises of the following:

.1 The work on the project is also to include any and all excavation, blasting, and supply of fill, bedding or other construction materials.

.2 The work on the project is also to include all items referenced above, below and on the attached plans and other specifications.

.3 The final project is to include a fully operational and commissioned system.

.4 Dust Control Procedures: provide and maintain Dust Control Barriers as required to carry out the work in locations designed and in accordance with Section 01 35 99 – Dust Control Procedures.

.5 No work is to commence until the SSSP is reviewed by Owner's Project Manager and deemed to meet the intent of the tender documents.

.6 Contractor is required to submit full project cost breakdown to the Department before first progress claim. To be subdivided into major work components. Individual work items will not be measured separately for payment.

1.3 CONTRACTOR USE OF PREMISES

.1 Contractor has restricted use of site.

.2 Coordinate use of premises under direction of Owner's Representative.

.3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

.5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Owner's Representative.

1.4 OWNER OCCUPANCY

.1 Owner will occupy premises during entire construction period for execution of normal operations.

.2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.5 RELATED WORK

.1 The following specification sections are referenced to indicate work responsibilities as specified and carried in other versions.

1. Section 22 05 00 – Common Work Results for Plumbing.

1.6 ON-SITE DOCUMENTS

.1 Maintain at job site documents as indicated in Division 01.

1.7 CONTRACT DOCUMENTS

.1 Legends and schedules in the Issued for Tender Drawings take precedence over the Technical Specifications with respect to products and materials identified.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA S269.1 Falsework for Construction Purposes.

.2 CAN/CSA-Z259.1 Safety Belts and Lanyards.

.3 CAN/CSA-Z259.10 Full body Harnesses.

.4 CAN/CSA-Z259.11 Shock Absorbers for Personal Fall Arrest Systems.

.5 CAN/CSA-Z259.2, Fall Arresting Devices, Personnel Lowering Devices and Lifelines.

.6 FCC No. 301 Standard for Construction Operations.

.2 FCC No. 302 Standard for Welding and Cutting.

.3 Transportation of Dangerous Goods Act Regulations.

.4 Newfoundland Occupational Health and Safety Act, Amended

.5 Consolidated Newfoundland and Regulations 1149 WMIS Regulations Under the Occupational Health and Safety Act

.6 Consolidated Newfoundland and Regulations 1165 Occupational Health and Safety Regulations under the Occupational Health and Safety Act.

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

.8 National Building Code of Canada.

1.2 RELATED SECTIONS

.1 Section 01 41 00 - Regulatory Requirements

1.3 SUBMITTALS

.1 At least 10 (ten) working days prior to commencing any site work: submit to Owner's Representative copies of:

.1 A complete Health and Safety Risk Assessment and Management Plan.

.2 Acceptance of the Project Health and Safety Risk Assessment and Management Plan and other submitted documents by the Owner's Representative shall only be viewed as acknowledgement that the contractor has submitted the required documentation under this specification section.

.3 Owner's Representative makes no representation and provides no warranty for the accuracy, completeness and legislative compliance of the Project Health and Safety Risk Management Plan and other submitted documents by this acceptance.

.4 Responsibility for errors and omissions in the Project Health and Safety risk Assessment and Management Plan and other submitted documents is not relieved by acceptance by Owner's Representative.

1.4 OCCUPATIONAL HEALTH AND SAFETY (PROJECT HEALTH AND SAFETY RISK ASSESSMENT AND MANAGEMENT PLANS)

.1 Conduct operations in accordance with latest edition of the Newfoundland Occupational Health and Safety (OH&S) Act and Regulations.

.2 Prepare a detailed Project Health and Safety Risk Assessment and Management Plan for the Owner. Assessment shall identify, evaluate and control job specific hazards and the necessary control measures to be implemented for managing hazards.

.3 Provide a copy of the Project Health and Safety Risk Assessment and Management Plan upon request to Occupational Health and Safety Branch, Department of Labour, Province of Newfoundland and Labrador and the Owner.

.4 The written Health and Safety Risk Assessment and Management Plan shall incorporate the following:

.1 A site-specific health and safety plan, refer to clause 1.5 Site-Specific Health and Safety Risk Assessment and Management Plan of this section for requirements.

.2 An organizational structure which shall establish the specific chain of command and specify the overall responsibilities of contractors employees at the work site.

.3 A comprehensive workplan which shall:

.1 define work tasks and objectives of site activities/operations and the logistics and resources required to reach these tasks and objectives

.2 establish personnel requirements for implementing the plan, and

.3 establish site specific training and notification requirements and schedules.

.4 A personal protected equipment (PPE) Program which shall detail PPE:

.1 Selection criteria based on site hazards.

.2 Use, maintenance, inspection and storage requirements and procedures.

.3 Decontamination and disposal procedures.

.4 Inspection procedures prior to during and after use, and other appropriate medical considerations.

.5 Limitations during temperature extremes, heat stress and other appropriate medical consideration.

.5 An emergency response procedure, refer to Clause 1.6 Supervision and Emergency Response Procedure of this section fro requirements.

.6 A hazard communication program for informing workers, visitors and individuals outside of the work area as required.

.7 A health and safety training program.

.8 General safety rules.

.5 Periodically review and modify as required each component of the Project Health and Safety Risk Assessment and Management Plan when a new hazard is identified during completion of work and when an error or omission is identified in any part of the Project Health and Safety Risk Assessment and Management Plan.

.6 Implement all requirements of the Project Health and Safety Risk Assessment and Management Plan.

.1 Ensure that every person entering the project site is informed of requirements under the Project Health and Safety Risk Assessment and Management Plan.

.2 Take all necessary measures to immediately implement any engineering controls, administrative contacts, personal protective equipment required or termination of work procedures to ensure compliance with the Project Health and Safety Risk Assessment and Management Plan.

1.5 SITE SPECIFIC HEALTH AND SAFETY PLAN

.1 Prepare a detailed site Specific Project Health and Safety Plan which shall:

.1 Contain certain hazard assessment results.

.2 Identify engineering and administrative demonstrative controls (work-practices and procedures) to be implemented for managing identified and potential hazards, and comply with applicable federal and provincial legislation and more stringent requirements that have been specified in these specifications.

.2 Review for completeness the hazard assessment results immediately prior to commencing work, when a new hazard is identified during completion of work and when an error or omission is identified.

.1 Be solely responsible for investigating, evaluation and managing any report of actual or potential hazards.

.2 Retain copies of all completed hazard assessments at the project site and make available to the Owner’s Representative immediately upon request.

1.6 SUPERVISION AND EMERGENCY RESCUE PROCEDURE

.1 Carry out work under the direct supervision of competent persons responsible for safety by ensuring the work complies with the appropriate section of OH&S Act and Regulations

.2 Assign a sufficient number of supervisory personnel to the work site.

.3 Provide a suitable means of communications for workers required to work alone.

.4 Develop an emergency rescue plan for the job site and ensure that supervisors and workers are trained in the emergency rescue plan.

.5 The emergency response plan shall address, as a minimum:

.1 Pre-emergency planning.
.2 Personnel roles, lines of authority and communication.
.3 Emergency recognition and prevention.
.4 Safe distances and places of refuge.
.5 Site security and control
.6 Evacuation routes and procedures
.7 Decontamination procedures which are not covered by the site specific safety and health plan.
.8 Emergency medical treatment and first aid.
.9 Emergency alarm, notification and response procedures including procedures for reporting incidents to local, provincial and federal government departments.
.10 PPE and emergency equipment.
.11 Procedures for handling emergency incidents.
.12 Site specific emergency response training requirements and schedules.

.6 The emergency response procedures shall be rehearsed regularly as part of the overall training program.

.7 Provide adequate first aid facilities for the jobsite and ensure that a minimum number of workers are trained in first aid in accordance with the First Aid Regulations.

1.7 CONTRACTORS SAFETY OFFICER

.1 The contractor shall employ a Safety Officer who will be solely responsible for the implementation and monitoring of the Project Health and Safety Risk Assessment and Management Plan, and will have the authority to implement health and safety changes as directed by the Owner's Representative. The Safety Officer shall have as a minimum:

.1 Completed training in hazardous occurrence management and response/protocols.
.2 Completed training in the use, maintenance of fall protection systems.
.3 Completed training in the design and construction of scaffolding.
.4 Completed training in confined space entry protocols and techniques.
.5 Completed training in First Aid.
.6 Have working knowledge of occupational safety and health regulations.

.7 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.

.8 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

.9 Prior to mobilization on-site, the Contractor's Safety Officer shall hold an orientation meeting (in conjunction with Owner's Representative) with the construction team to review project occupational health and safety. Include a review of:

.1 Health and Safety Risk Assessment and Management Plan.

.2 Construction Safety Measures.

.3 Supervision and Emergency Rescue Procedures.

.10 Report directly to and be under direction of site supervisor.

1.8 HEALTH AND SAFETY COMMITTEE

.1 Establish an Occupational Health and Safety Committee where ten or more workers are employed on the job site as per the OH&S Act and Regulations.

.3 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.

.4 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.

1.9 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 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 UNFORSEEN HAZARDS

.1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction. Advise Owner's Representative verbally and in writing.

1.11 INSTRUCTION AND TRAINING

.1 Workers shall not participate in or supervise any activity on the work site until they have been trained to a level required by this job function and responsibility. Training shall as a minimum thoroughly cover the following:

.1 Federal and Provincial Health and Safety Legislation requirements including roles and responsibilities of workers and person(s) responsible for implementing, monitoring and enforcing health and safety requirements.

.2 Safety and health hazards associated with working on a contaminated site including recognition of symptoms and signs which might indicate over exposure to hazards.

.3 Limitations, use, maintenance and disinfection-decontamination of personal protective equipment associated with completing work.

.4 Limitations, use, maintenance and care of engineering controls and equipment.

.5 Limitations and use of emergency notifications and response equipment including emergency response protocol.

.6 Work practices and procedures to minimize the risk of an accident and hazardous occurrence from exposure to a hazard.

.2 Provide and maintain training of workers, as required, by Federal and Provincial legislation.

.3 Provide copies of all training certificates to Owner's Representative for review, before a worker is to enter the work site.

.4 Authorized visitors shall not access the work site until they have been:

.1 Notified of the names of persons responsible for implementing, monitoring and enforcing the health and Safety Risk Assessment and Management Plan.

.2 Briefed on safety and health hazards present on the site.

.3 Instructed in the proper use and limitations of personal protective equipment.

.4 Briefed as the emergency response protocol including notification and evacuation process.

.5 Informed of practices and procedures to minimize risks from hazards and applicable to activities performed by visitors.

1.12 CONSTRUCTION SAFETY MEASURES

.1 Observe construction safety measures of National Building Code, latest edition, Provincial Government, OH&S Act and Regulations, Workplace Health and Safety and Compensation Commission and Municipal Authority provided that in any case of conflict or discrepancy more stringent requirements shall apply.

.2 Administer the project in a manner that will ensure, at all times, full compliance with Federal and Provincial Acts, regulations and applicable safety codes and the site Health and Safety Risk Assessment and Management Plan.

.3 Provide Owner's Representative with copies of all orders, directions and any other documentation, issued by the Provincial Department of Government Services, Occupational Health and Safety branch immediately after receipt.

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 and authority having jurisdiction, and in consultation with Owner's Representative.

1.14 HEALTH AND SAFETY MONITORING

.1 Periodic inspections of the contractor's work may be carried out by the Owner's Representative to maintain compliance with the Health and Safety Program. Inspections will include visual inspections as well as testing and sampling as required.

.2 The contractor shall be responsible for any and all costs associated with delays as a result of contractor's failure to comply with the requirements outlined in this section.

1.15 NOTIFICATION

.1 For projects exceeding thirty (30) days or more, the contractor shall, prior to the commencement of work, notify in writing the Work Place Health and Safety Division, Department of Labour with the following information:

.1 Name and location of construction site.

.2 Company name and mailing address of contractor doing the work.

.3 The number of workers to be employed.

.4 A copy of the Health and Safety Risk Assessment and Management Plan if requested.

1.16 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Owner's Representative.

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

.3 Owner's Representative may stop work if non-compliance of health and safety regulations is not corrected.

1.17 WHMIS

.1 Ensure that all controlled products are in accordance with the Workplace Hazardous Materials Information System (WHMIS) Regulations and Chemical Substances of the

OH&S Act and Regulations regarding use, handling, labelling, storage, and disposal of hazardous materials.

.2 Deliver copies of relevant Material Safety Data Sheets (MSDS) to job site and the Owner's Representative. The MSDS must be acceptable to Labour Canada and Health and Welfare Canada for all controlled products that will be used in the performance of this work.

.3 Train workers required to use or work in close proximity to controlled products as per OH&S Act and Regulations.

.4 Label controlled products at jobsite as per OH&S and Regulations.

.5 Provide appropriate emergency facilities as specified in the MSDS where workers might be exposed to contact with chemicals, e.g. eye-wash facilities, emergency shower.

.1 Workers to be trained in use of such emergency equipment.

.6 Contractor shall provide appropriate personal protective equipment as specified in the MSDS where workers are required to use controlled products.

.1 Properly fit workers for personal protective equipment

.2 Train workers in care, use and maintenance of personal protective equipment.

.7 No controlled products are to be brought on-site without prior approved MSDS.

.8 The MSDS are to remain on site at all times.

1.18 OVERLOADING

.1 Ensure no part of work or associated equipment is subjected to loading that will endanger its safety or will cause permanent deformation.

1.19 FALSEWORK

.1 Design and construct falsework in accordance with CSA S269.1.

1.20 SCAFFOLDING

.1 Design, erect and maintain scaffolding in accordance with CSA S269.2 and Sections 91-97 of the OH&S Act and Regulations.

.2 Ensure that fall-restraint or fall-arrest devices are used by all workers working at elevations greater than 3.05 metres above grade or floor level in accordance with CSA Z259.

1.21 PERSONAL PROTECTIVE EQUIPMENT

.1 Ensure workers on the jobsite use personal protective equipment appropriate to the hazards identified in the Risk Assessment and Management Plan and those workers are trained in the proper care, use, and maintenance of such equipment.

.2 PPE selections shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, task-specific conditions, duration and hazards and potential hazards identified on site.

.3 Provide all workers and up to five (5) visitors to the site with CSA approved eye protection sufficient to act as a protective barrier between the eye and airborne contaminants, hazardous materials and physical hazard.

.4 Provide workers and up to five (5) visitors to the site with CSA approved hard hats.

1.22 CONFINED SPACE WORK

.1 Comply with requirements of Canada Occupational Safety and Health Regulations, Part XI and Consolidated Regulations Newfoundland and Labrador (CRNL) OH&S 1165/96.

.2 Provide approved air monitoring equipment where workers are working in confined spaces and ensure any test equipment to be used is calibrated, in good working order and used by trained persons.

.3 Develop a confined space entry program specific to the nature of work performed and in accordance with OH&S Act and Regulations and ensure supervisors and workers are trained in the confined space entry program.

.1 Ensure that personal protective equipment and emergency rescue equipment appropriate to the nature of the work being performed is provided and used.

.4 Provide and maintain training of workers, as required by the Federal and Provincial Legislation.

.5 Provide Owner's Representative with a copy of an "Entry Permit" for each entry into the confined space to ensure compliance with Federal and Provincial Legislation.

1.23 **HAZARDOUS** MATERIALS

.1 Should material resembling hazardous materials (asbestos/mould) be encountered during the execution of work and notify Owner's Representative. Do not proceed until written instructions have been received from Owner's Representative.

.2 Unless otherwise noted, for hazardous materials abatement and repair, employ the services of a recognized Environmental Consultant to provide all air monitoring and testing services for regulatory requirements.

1.24 WORK STOPPAGE

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

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 FIRES

.1 Fires and burning of rubbish on site not permitted.

1.2 DISPOSAL OF WASTES

.1 Do not bury rubbish and waste materials on site.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.3 DRAINAGE

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.4 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties where indicated.

.2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas indicated or designated by Owner’s Representative.

1.5 WORK ADJACENT TO WATERWAYS

.1 Do not operate construction equipment in waterways.

.2 Do not use waterway beds for borrow material.

.3 Do not dump excavated fill, waste material or debris in waterways.

.4 Design and construct temporary crossings to minimize erosion to waterways.

.5 Do not skid logs or construction materials across waterways.

.6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

.7 Do not blast under water or within 100 m of indicated spawning beds.

1.6 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this contract.

.2 Control emissions from equipment and plant to local authorities emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.7 NOTIFICATION

.1 Owner's Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of environmental protection. Contractor: after receipt of such notice, inform Owner's Representative of proposed corrective action and take such action as approved by Owner's Representative.

.2 Owner's Representative may issue stop order of work until satisfactory corrective action has been taken.

.3 No time extensions will be granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Where building related projects involve work that could potentially disturb asbestos or lead based paints, disturbances must be carefully controlled by registered abatement contractors in accordance with the Occupational Health and Safety Regulations (OHS) and other applicable Sections in this Contract. The purpose of this procedure is to ensure that nuisance dust, not containing asbestos or lead, is controlled in an effective manner.

.2 Section includes:

.1 Ensuring any maintenance, repair, construction or renovation activity that impacts building materials or creates dust is performed in such a way as to eliminate, minimize, contain and clean up any and all dust generated by the activity. This applies to work preparation, work activities and post-work activities.

.2 This applies to, but is not limited to, the following types of dust generating activities:

.1 Disturbing gypsum board, plaster or other surfacing materials.

.2 Disturbing concrete or wood containing materials.

.3 Handing or disturbing fibrous building insulation.

.4 Generating welding fumes: in addition to the requirements of this procedure, a hot work permit is also required to be completed by the contractor and submitted to the Owner's Representative for review if hot work is required in an occupied building.

1.2 RELATED WORK

.1 Division 1 – General Requirements.

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB)

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

.2 Canadian Standards Association (CSA)

PART 2 PRODUCTS

2.1 MATERIALS

.1 Polyethylene sheet.

.2 Wood studs for stand-alone barriers.

PART 3 EXECUTION

3.1 PRE-WORK ACTIVITIES

.1 The contractor shall ensure the following prior to commencing work:

.1 Specific dust generating activities and associated controls shall be addressed in the Site Specific Health and Safety Plan.

.2 Workforce, including sub-contractors, must be made aware of the site dust control requirements.

.3 Check the various work zones within the building and adjacent areas to confirm the area are clean.

.4 Access to all active work areas shall be restricted to authorized contractors.

.5 For occupied buildings, dust generating activities shall be performed after normal hours of operations, unless prior permission if received from the Owner's Representative.

3.2 WORK ACTIVITIES

.1 Dust producing projects shall be classified as small scale, medium scale or large scale projects, as detailed in paragraph 3.3.

.2 For all dust generating activities, Contractor is required to have Site Safety Officer present to ensure dust control procedures are properly followed.

.3 Any dust related complaints brought to the Contractors attention, must be immediately reported to Owner's Representative, and an incident investigation must be initiated to prevent reoccurrence.

.4 Where practical, dust generation should be eliminated or minimized through the use of proper engineering controls (i.e. containment at source such as drilling wall surface through a wet sponge, wet suppression, use of HEPA vacuum equipped tools, etc).

.5 Dust generating power tools shall be equipped with HEPA filtered dust collectors where practical. Power tools capable of generating dust without dust collection shall only be used in conjunction with suitable work area containment and with Owner's Representative approval.

.6 Walk-off mats shall be employed for medium and large scale dust generating projects at all worker entrances/exits. Purpose of these mats is to trap dust from equipment and shoes of personnel leaving the dust contaminated work zone. Mats shall be vacuumed daily, or more frequently as necessary, using HEPA filtered vacuums. Mats shall be of sufficient size to place both feet on mat at once.

3.3 PROJECT CLASSIFICATION

.1 Class A - Small Scale Project: (Dust producing activities disturbing less than one (1) linear meter or one (1) square meter of material. These are small scale, short duration jobs generating minimal dust.

.1 Some examples include:

.1 Installing wires or cables, sanding/repairing small section of wall, cutting out gypsum board to install receptacles.

.2 Carry out Work as follows:

.1 Remove all furniture, fixtures and belongings from the work area to a minimum of 1.5 m in all directions.

.2 Restrict access to immediate work area. Keep all doors closed where practical. Post "Dust Hazard Area – Do Not Enter" signs at all entrances to work area. In common areas use barrier tape to establish the regulated area.

.3 Place a drop cloth of polyethylene sheeting immediately underneath the work area extending a minimum of 1.5 m in each direction (unless flooring is easily cleanable).

.4 Cover all air return or exhaust vents if within 1.5 m of the work area with polyethylene sheeting and duct tape.

.5 Complete the task, minimizing dust production, as prescribed in paragraph 3.2 - Work Activities.

.6 When the work is completed, wet-wipe polyethylene sheeting and flooring and if necessary, other areas close by with a damp rag.

.7 Visually inspect the area for any remaining dust and wet wipe as necessary.

.8 If installed, remove polyethylene sheeting from air return and exhaust vents.

.9 Where practical, transport debris after hours using least congested and most direct routes. If any debris is spilled outside the work area, immediately wet-wipe debris.

.10 Clean all tools and equipment before removal from the work area.

.2 .Class B - Medium Scale Project (Dust producing activities disturbing greater than one (1) square meter and less than 30 square meters of material) with anticipated moderate dust levels that are typically one shift or more in duration.

.1 Examples include:

.1 Sanding several sheets of gypsum board.

.2 Electrical work above ceiling tiles where general debris is known above the ceiling.

.3 Removing numerous ceiling tiles in an area.

.4 New wall construction.

.2 Carry out the Work as follows:

.1 Determine the most effective way of isolating the work area from occupants (i.e. using plastic barriers or by sealing off doors).

.2 Complete all items specified under small scale projects.

.3 While performing the work, limit the dust generated by removing the materials in sections, lightly misting the material as necessary. Debris shall be bagged immediately for disposal. In addition to wet wiping, HEPA filtered vacuum systems shall be employed where practical to limit airborne dust.

.4 When the task is completed, HEPA vacuum and/or wet wipe the polyethylene sheeting.

.5 Prior to removing any temporary wall partitions from floor to ceiling or polyethylene barriers, a final inspection shall be preformed by the Site Safety Officer or designate to ensure proper clean up has been completed. This inspection shall be documented by the Contractor and made available at the request of the Owner's Representative.

.6 Establishment of containment may result in the accumulation of dust within the enclosure. As such, the need for respiratory protection and decontamination would be greater than for small scale projects (i.e. N95 half face respirator with tyvek body covering).

.3 Class C - Large Scale Projects (Dust Producing Activities disturbing greater than 30 meters of material with anticipated high dust levels and typically involves multiple work shifts.

.1 Examples include:

.1 Major demolition or construction.

.2 Extensive renovations to wall or ceiling surfaces.

.3 Generating significant amounts of concrete dust.

.2 Carry out the Work as follows:

.1 Complete all items as prescribed under the Medium Scale Projects section.

.2 If the work produces dust that cannot be limited by removal in sections or misting and the work area configuration allows, use HEPA filtered negative air units with the intake directly across from the dust generating activity. Exhaust the HEPA unit outside the building.

.3 If using a disposal cart or container to transport debris within the building, ensure the lid is tightly secured and the wheels are clean prior to exiting the work area.

.4 If local source capture is employed (i.e. HEPA filtered power tool) and no significant debris anticipated then treat as a medium scale project.

.5 Negative air units shall be left operating at the completion of cleanup, for the duration stipulated in Table 4, CAN/CSA Z317.13-F07.

.6 Windows, doors, exhaust vents and supply intakes shall be sealed off in dust generating areas. Upper seals must be employed where necessary to prevent the spread of dust into adjacent areas.

.7 The contractor must be able to show that the work zone is negatively pressurized in relation to adjacent occupied areas.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES AND CODES

.1 Perform Work in accordance with National Building Code of Canada (NBC) including all amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: stop work immediately should materials believed to contain asbestos be encountered in during the execution of the work and notify Owner's Representative. Do not proceed until written instructions have been received from Owner's Representative. Perform asbestos abatement and repair in accordance with Newfoundland and Labrador Asbestos Abatement Regulations, Latest Edition.

.2 Mould: stop work immediately should material resembling mould be encountered during the execution of work and notify Owner's Representative. Do not proceed until written instructions have been received from Owner's Representative.

1.3 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions.

1.4 RELICS AND ANTIQUITIES

.1 Protect relics, antiquities, items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during course of work.

.2 Give immediate notice to Owner's Representative and await Owner's Representative's written instructions before proceeding with work in this area.

.3 Relics, antiquities and items of historical or scientific interest remain Government of Canada property.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of this contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

1.2 INDUSTRY STANDARDS

.1 Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made part of the Contract Documents by reference.

.2 All construction industry standards referenced in this specification to meet the edition of the standard referenced by the National Building Code of Canada (NBC). If the construction industry standard in not referenced in the National Building Code of Canada (NBC), the latest edition of the standard shall apply.

.3 Each entity engaged in construction on this Project must be familiar with construction industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Construction Documents.

.1 Where copies of construction industry standards are needed to perform a required construction activity, obtain copies directly from publication source and make them availably upon request.

1.3 ABBREVIATIONS AND ACRONYMS FOR INDUSTRY ORGANIZATIONS

.1 Where abbreviations and acronyms are used, they shall mean the recognized name of the entities in the following list. Names are believed to be accurate and up-to-date as of the date of the Contract Documents.

.2 Industry Organizations:

.1 Air Conditioning and Mechanical Contractors Association (AMCA).

.2 Air Conditioning and Refrigeration Institute (ARI).

.3 Americans with Disability Act (ADA).

.4 Air Movement and Control Association (AMCA).

.5 The Aluminum Association, Inc. (AA).

.6 American Architectural Manufacturers Association (AAMA).

.7 American Association of State Highway and Transportation Officials (AASHTO).

.8 American Association of Textile Chemists and Colourists (AATCC).

.9 American Bearing Manufacturers Association (ABMA).

.10 American Boiler Manufacturer's Association (ABMA).
.11 American Concrete Institute (ACI).
.12 American Industrial Hygiene Association (AIHA).
.13 American Institute of Steel Construction (AISC).
.14 American Iron & Steel Institute (AISI).
.15 American National Standards Institute (ANSI).
.16 American Petroleum Institute (API).
.17 American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
.18 American Society of Mechanical Engineers (ASME).
.19 American Society of Sanitary Engineer's (ASSE).
.20 American Society for Testing and Materials (ASTM).
.21 American Water Works Association (AWWA).
.22 American Welding Society (AWS).
.23 American Wood-Preservers' Association (AWPA).
.24 Architectural Woodwork Institute (AWI).
.25 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
.26 Asphalt Institute (AI).
.27 Associated Air Balance Council (AABC).
.28 Association of the Wall and Ceilings Industries International (AWEI).
.29 Atomic Energy Control Board Regulations.
.30 Brick Industry Association (BIA).
.31 Building Industry Consulting Services International (BICSI).
.32 Canada Green Building Council (CaGCB).
.33 Canada Labour Code.
.34 Canadian Council of Ministers of the Environment (CCME).
.35 Canadian Code for Preferred Packaging.
.36 Canadian Construction Materials Centre (CCMC).
.37 Canadian Environmental Protection Act (CEPA).
.38 Canadian Gas Association (CGA).
.39 Canadian General Standards Board (CGSB).
.40 Canadian Institute of Steel Construction (CISC).
.41 Canadian Nursery Landscape Association (CNLA).
.42 Canadian Paint Manufacturer's Association (CPMA).
.43 Canadian Roofing Contractors' Association (CRCA).
.44 Canadian Sheet Steel Building Institute (CSSBI).
.45 Canadian Standards Association (CSA).
.46 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA).

.47 Canadian Urethane Foam Contractors' Association Inc. (CUFCA).
.48 Carpet and Rug Institute (CRI).
.49 Ceramic Tile Institute (CTI).
.50 Consumer Electronics Association (CEA).
.51 Cooling Technology Institute (CTI).
.52 Department of Justice Canada (Jus).
.53 Electrical and Electronic Manufacturers' Association of Canada (EEMAC).
.54 Electronic Industries Alliance (EIA).
.55 Environment Canada (EC).
.56 The Environmental Choice Program.
.57 Environmental Protection Agency (EPA).
.58 Environmental Protection Services (EPS).
.59 ETL Listing Laboratories (ETL).
.60 Factory Mutual (FM).
.61 Federal Communications Commission (FCC).
.62 Flat Glass Manufacturers Association (FGMA).
.63 Green Seal Environmental Standards.
.64 Health Canada - Workplace Hazardous Materials Information System (WHMIS).
.65 Hydraulics Institute (HI).
.66 Hydronic Institute of Boiler and Radiator Manufacturers (IBR).
.67 Industry Canada - Terminal Attachment Program.
.68 Institute of Electrical and Electronics Engineers (IEEE).
.69 Institute for Research in Construction (IRC).
.70 Insulated Cable Engineers Association (ICEA).
.71 International ElectroTechnical Commission (IEC).
.72 International Masonry Industry All-Weather Council (IMIAC).
.73 International Standards Organization (ISO).
.74 Laminators Safety Glass Association (LSGA).
.75 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
.76 Master Painters Institute (MPI).
.77 National Energy Code of Canada for Buildings (NECB).
.78 National Association of Architectural Metal Manufactures (NAAMM).
.79 National Association of Corrosion Engineers (NACE).
.80 National Building Code of Canada (NBC).
.81 National Bureau of Standards/Products Standard (NBS/PS).
.82 National Electrical Manufacturers Association (NEMA).
.83 National Environmental Balancing Bureau (NEBB).

.84 National Fire Code of Canada (NFC).
.85 National Fire Protection Association (NFPA).
.86 National Floor Covering Association (NFCA).
.87 National Hardwood Lumber Association (NHLA).
.88 National Lumber Grades Authority (NLGA).
.89 National Plumbing Code of Canada (NPC).
.90 National Research Council Canada (NRC).
.91 National Roofing Contractors Association (NRCA).
.92 National Sanitation Foundation (NSF).
.93 Newfoundland Occupational Health and Safety Act.
.94 Plumbing and Drainage Institute (PDI).
.95 Province of Newfoundland and Labrador Building Accessibility Regulations.
.96 Provincial Boiler, Pressure Vessel and Compressed Gas Regulations.
.97 Scientific Equipment and Furniture Association (SEFA).
.98 Sealant and Waterproofer's Institute.
.99 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
.100 Society of Automotive Engineers (SAE).
.101 The Society for Protective Coatings (SSPC).
.102 South Coast Air Quality Management District (SCAQMD).
.103 Telecommunications Distribution Methods Manual (TDMM).
.104 Telecommunications Industries Association (TIA).
.105 Terrazzo Tile and Marble Association of Canada (TTMAC).
.106 Thermal Insulation Association of Canada (TIAC).
.107 Transport Canada (TC).
.108 Transport Canada - Marine Safety (TCMS).
.109 Treasury Board of Canada (TB).
.110 Treasury Board Information Technology Standard (TBITS).
.111 Truss Plate Institute of Canada (TPIC).
.112 Underwriters' Laboratories Inc. (UL).
.113 Underwriter's Laboratories of Canada (ULC).
.114 United States Federal Trade Commission (US Federal Trade Commission).
.115 U.S. Coast Guard Equipment List (USCG).
.116 U.S. Department of Transportation (DOT).
.117 National Fireproofing Contractors Association (NFCA).

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SECTIONS INCLUDE

.1 Inspection and testing, administrative and enforcement requirements.

.2 Mock-ups.

.3 Equipment and system adjust and balance.

1.2 RELATED SECTIONS

.1 Section 01 78 00 – Closeout Submittals

1.3 INSPECTION

.1 Allow Owner's Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Owner's Representative instructions.

.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 Owner's Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner's Representative shall pay cost of examination and replacement.

1.4 ACCESS TO WORK

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

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

1.5 PROCEDURES

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

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

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

1.6 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 Owner's Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

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

.3 If in opinion of Owner's Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Owner's Representative.

1.7 REPORTS

.1 Submit 3 copies of inspection and test reports to Owner's Representative, plus electronic copies in PDF format.

.2 Provide copy to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

.3 Include copy of all inspection and test reports in Commissioning Manuals.

1.8 MOCK-UPS

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

.2 Construct in all locations acceptable to Owner's Representative as specified in specific Section.

.3 Prepare mock-ups for Owner's Representative review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 Remove mock-up at conclusion of Work or when acceptable to Owner's Representative

.6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

.7 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be verified.

.8 Mock-ups may remain as part of Work.

1.9 EQUIPMENT AND SYSTEMS

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

.2 Mechanical – coordinate with mechanical division.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 52 00 - Construction Facilities.

.2 Section 01 56 00 - Temporary Barriers and Enclosures.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.3 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.4 WATER SUPPLY

.1 Arrange for connection with appropriate utility company and pay all costs for installation, maintenance and removal.

1.5 TEMPORARY HEATING AND VENTILATION

.1 Pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel operation, maintenance and removal of equipment. Use of direct, fired heaters discharging waste products into work areas will not be permitted unless prior approval is given by Owner's Representative.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

.5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10°C and relative humidity less than 60% in areas where construction is in progress.

.1 Maintain minimum temperature of 10°C or higher where specified as soon as finished work is commenced. Maintain until acceptance of structure by Owner's Representative.

.2 Maintain ambient temperature and humidity levels as required for comfort of office personnel.

.5 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

.7 Be responsible for damage to Work due to failure in providing adequate heat, humidity and protection during construction.

.8 Use of new or existing systems for temporary heating, ventilating or air conditioning will not be permitted.

1.6 TEMPORARY POWER AND LIGHT

.1 Provide and pay for temporary power during constructing for temporary lighting, heating, site construction trailers and operating of power tools in accordance with governing regulations and the Canadian Electrical Code, latest edition.

.2 Arrange for connection with Utility company. Pay all costs for installation, maintenance and removal of cables, distribution and branch panel boards, poles, lighting, heating and general power receptacles as required.

.3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

.4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx. Temporary lighting to consist of wiring, pig tail sockets and 75 watt shatterproof incandescent lamps to provide a minimum light level of 162 lux.

.5 Electrical power and lighting systems installed under this contract may be used for construction requirements only with prior approval of Owner's Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this contract. Replace lamps which have been used for more than 3 months.

.6 General contractor responsible for payment of all electrical energy charges associated with temporary power up to date of substantial completion.

1.7 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

1.8 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

.3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Owner's Representative.

1.9 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephone, fax, data hook up, lines and equipment necessary for own use and use of Owner's Representative.

1.10 SITE SIGN AND NOTICES

.1 Contractor is responsible for the construction of job sign frame and the installation of the plywood job sign. Timber frame shall be constructed as specified and detailed on "Job Sign Support Frame Detail". Plywood job sign and timber frame shall remain the property of the Owner and shall be disposed of at the discretion of the Owner.

.2 Locate job sign as directed by Owner's Representative so as to ensure good visibility by passing traffic.

.3 Construct timber job sign frame using two (2) 140 x 140mm timber posts set vertically in concrete to a ground depth of 1000mm or below the frost line, whichever is greater. Install three (3) 38 x 89mm horizontal timber braces. Attach plywood sign to timber frame using galvanized nails. Paint timber frame with two (2) coats of white paint if using untreated timber. Backfill compact and level ground around job sign frame to the satisfaction of the Owner's Representative.

1.11 REMOVAL OF TEMPORARY FACILITIES

.1 Remove temporary facilities from site when directed by Owner's Representative.

.2 When project is closed down at end of construction season keep temporary facilities operational until close down or removal is approved by Owner's Representative.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Construction aids.

.2 Office and sheds.

.3 Parking.

.4 Project identification.

1.2 RELATED SECTIONS

.1 Section 01 51 00 - Temporary Utilities.

.2 Section 01 56 00 - Temporary Barriers and Enclosures.

1.3 INSTALLATION AND REMOVAL

.1 Provide construction facilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.4 SCAFFOLDING

.1 Provide and maintain scaffolding in rigid, secure and safe manner.

.2 Erect scaffolding independent of walls. Remove promptly when no longer required. Refer to Division 01.

1.5 HOISTING

.1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.

.2 Hoists cranes shall be operated by certified operator.

1.6 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.7 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of work.

.2 Provide and maintain adequate access to project site.

.3 Build and maintain temporary roads where indicated or directed by Owner's Representative and provide snow removal during period of Work.

.4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.

1.8 CONTRACTOR'S SITE OFFICES

.1 Provide office heated to 22 ^{o}C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table, fax machine, telephone, file cabinet and chair. Provide an accessible washroom within the contractor's site office.

.2 Accessible washroom, meeting space and entrance to contractor's site office to meet the accessibility requirements of the NL Accessibility Act and Regulations, and CSA B651, Accessible Design for the Built Environment.

.3 Provide a clearly marked and fully stocked first-aid case in a readily available location.

.4 Subcontractors may provide their own offices as necessary. Direct location of these offices.

1.9 OWNER'S REPRESENTATIVE SITE OFFICE

.1 Provide temporary office for Owner's Representative.

.2 Inside dimensions minimum 4.8 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 - 50% opening windows and one lockable door. Door and access to the Owner's Representative site office to meet the accessibility requirements of the NL Accessibility Act and Regulations, and CSA B651, Accessible Design for the Built Environment.

.3 Insulate building and provide heating system to maintain 22°C inside temperature at -20°C outside temperature.

.4 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19mm thick plywood.

.5 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10% upward light component.

.6 Site office to have washroom facility complete with running water and sewage disposal. Maintain supply of washroom supplies. Washroom to meet the accessibility requirements of the NL Accessibility Act and Regulations, and CSA B651, Accessible Design for the Built Environment.

.7 Equip office with drawing laydown table, fax machine, file cabinet, two chairs, telephone, phone line for internet.

.8 Maintain in clean condition.

1.10 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.11 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.12 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Barriers.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.3 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

.2 Provide as required by governing authorities.

1.4 DUST TIGHT SCREENS

.1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such work is complete.

1.5 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.6 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Owner’s Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Product quality, availability, storage, handling, protection, and transportation.

.2 Manufacturer's instructions.

.3 Quality of Work, coordination and fastenings.

1.2 RELATED SECTIONS

.1 Section 01 45 00 – Quality Control.

.2 Section 01 73 00 – Execution.

1.3 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.

.2 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

1.4 QUALITY

.1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Owner’s Representative based upon requirements of Contract Documents.

.4 Within seven (7) working days of written request by Owner’s Representative, submit following information for material and equipment proposed for supply:

.1 Name and address of manufacturer.

.2 trade name, model and catalogue number,

.3 performance, descriptive and test data,

.4 manufacturer's installation or application instructions,

.5 evidence of arrangements to procure.

.5 Use products of one manufacturer for material and equipment of same type or classification unless otherwise specified.

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.5 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Owner's Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of work.

.2 In event of failure to notify Owner's Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Owner's Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.6 STORAGE, HANDLING AND PROTECTION

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

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.4 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.5 Remove and replace damaged products at own expense and to satisfaction of Owner's Representative.

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

1.7 TRANSPORTATION

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

1.8 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Owner's Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Owner's Representative may establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Owner's Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.9 QUALITY OF WORK

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

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

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Owner's Representative, whose decision is final.

1.10 CO-ORDINATION

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

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

1.11 CONCEALMENT

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

.2 Before installation, inform Owner's Representative if there is interference. Install as directed by Owner's Representative.

1.12 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.13 LOCATION OF FIXTURES

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

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Owner's Representative of conflicting installation. Install as directed.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Owner's Representative.

1.14 FASTENINGS GENERAL

.1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work, unless stainless steel or other material is specifically requested in affected specification section.

.2 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood plugs are not acceptable.

.3 Conceal fasteners where indicated. Space evenly and lay out neatly.

.4 Fastenings which cause Spalding or cracking are not acceptable.

.5 Obtain Owner's Representative's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166.

1.15 FASTENINGS - EQUIPMENT

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

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.16 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Owner's Representative.

1.17 EXISTING UTILITIES

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

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

.3 Submit schedule to and obtain approval from Owner's Representative for any shut-down or closure of active services or facility. Adhere to approved schedule and provide notice to affected parties.

.4 Where unknown services are encountered, immediately advise Owner's Representative and confirm findings in writing.

.5 Remove abandoned services lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Owner's Representative.

1.18 SELECTION OF MATERIAL AND EQUIPMENT

.1 Material and equipment will be specified in the tender documents, and selected by Contractor, by one or more of the following methods:

.1 Specification by reference to a relevant Standard, such as CSA, ASTM, ULC, etc., select any material or equipment that meets or exceeds the specified.

.2 Specification by reference to an accepted product evaluation publication, such as the CGSB "Qualified Products List", or CCMC Registry of Product Evaluations", - select any manufacturer's product so listed.

.3 Specification by Prescriptive or Performance specification – select any material or equipment meeting or exceeding specification.

.4 Specification by identification of one or more Manufacturer's specific product(s) as an "Acceptable Product", along with a listing of other manufacturers who may offer equivalent products – select any product so named, or select from equivalent product(s) of other listed manufacturers.

.2 "Acceptable Product" is deemed to be a complete and working commodity as described by a manufacturer's name, catalogue number, trade name, or any combination thereof, and will constitute the minimum standard of acceptance.

.3 Owner's Representative will determine acceptability of Contractor's selection of material and equipment at time of Shop Drawing review.

.4 When material or equipment is specified by a Standard, Prescriptive or Performance specification, upon request of the Owner's Representative, obtain from manufacturer an independent laboratory reporting, showing that material or equipment meets or exceeds the specified requirements.

1.19 SUBSTITUTION OF MATERIAL AND EQUIPMENT

.1 **Prior to Tender** closing bidders may propose addition of other manufacturer's names to those listed in the tender documents providing requests are made in writing at least 7 days prior to tender closing date or bid depository where bid depository is used. Owner's Representative will inform all prospective bidders of decision by addendum, issued at least 5 days prior to the tender closing date.

.2 **After Contract award** substitutions of material or equipment, other than as selected by Contractor from those specified, will be considered by Owner's Representative only if:

.1 material or equipment selected from those specified are not available

.2 delivery date of material or equipment selected from those specified would unduly delay completion of the Contract; or

.3 alternative material or equipment to those specified, provided they are determined by the Owner's Representative to be equivalent to or better that those specified, will result in a credit to the Contract amount.

.3 Requests for substitutions after Contract award must be accompanied by sufficient information in the form of shop drawings, manufacturer's literature, samples or other data to permit proper investigation of the substitutes used. Requests must also include statements of respective costs of material or equipment originally specified and the proposed substitution.

.4 Should a proposed substitution be accepted after Contract award either in part or in whole, assume full responsibility and costs when substitution affects other work on Project. Contractor to pay for design or drawing changes required as a result of the substitution.

.5 Amounts of all credits arising from approval of substitutions after Contract award will be determined by Owner's Representative and the Contract amount will be reduced accordingly.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Field engineering survey services to measure and stake site.

.2 Survey services to establish and confirm inverts for Work.

.3 Recording of subsurface conditions found.

1.2 QUALIFICATIONS OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practise in the Province of Newfoundland and Labrador.

1.3 SURVEY REFERENCE POINTS

.1 Existing base horizontal and vertical control points are designated on drawings.

.2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to Owner's Representative.

.4 Report to Owner's Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.5 Require surveyor to replace control points in accordance with original survey control.

1.4 SURVEY REQUIREMENTS

.1 Establish permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill placement .

.4 Establish pipe invert elevations.

.5 Stake batter boards for foundations.

.6 Establish foundation column locations and floor elevations.

.7 Establish lines and levels for mechanical and electrical work.

1.5 EXISTING SERVICES

.1 Where work involves breaking into or connecting to existing services, carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to pedestrian and vehicular traffic.

.2 Before commencing work, establish location and extent of service lines in area of Work and notify Owner's Representative of findings.

.3 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Owner's Representative.

1.6 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Owner's Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Owner's Representative.

1.7 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 Record locations of maintained, re-routed and abandoned service lines.

1.8 SUBMITTALS

.1 Submit name and address of Surveyor to Owner's Representative.

.2 On request of Owner's Representative, submit documentation to verify accuracy of field engineering work.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.9 SUBSURFACE CONDITIONS

.1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should Owner's Representative determine that conditions do differ materially, instructions will be issued for changes in Work.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Requirements and limitations for cutting and patching the Work.

1.2 RELATED SECTIONS

.1 Section 01 11 00 - Summary of Work.

1.3 SUBMITTALS

.1 Submit written request in advance of cutting or alteration which affects:

.1 Structural integrity of any element of Project.
.2 Integrity of weather-exposed or moisture-resistant elements.
.3 Efficiency, maintenance, or safety of any operational element.
.4 Visual qualities of sight-exposed elements.
.5 Work of Owner or separate contractor.

.2 Include in request:

.1 Identification of Project.
.2 Location and description of affected Work.
.3 Statement on necessity for cutting or alteration.
.4 Description of proposed Work, and products to be used.
.5 Alternatives to cutting and patching.
.6 Effect on Work of Owner or separate contractor.
.7 Written permission of affected separate contractor.
.8 Date and time work will be executed.

1.4 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

.6 Obtain Owner's Representative's approval before cutting, boring or sleeving load-bearing members.

1.5 EXECUTION

.1 Execute cutting, fitting, and patching to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.9 Restore work with new products in accordance with requirements of Contract Documents.

.10 Fit Work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material, full thickness of the construction element.

.12 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.

.13 Conceal pipes, conduits, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

.14 Make cuts with clean, true, smooth edges.

.15 Where new work connects with existing, and where existing work is altered, cut, patch and make good to match existing work.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

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

1.2 RELATED SECTION

.1 Section 01 77 00 - Closeout Procedures.

1.3 PROJECT CLEANLINESS

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

.2 Remove waste materials and debris from site at the end of each working day. Do not burn waste materials on site.

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

.4 Provide on-site containers for collection of waste materials and debris.

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

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

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

1.4 FINAL CLEANING

.1 Refer to General Conditions.

.2 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

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

.4 When the Work is Totally Performed, remove surplus products, tools, construction machinery and equipment. Remove waste products and debris other than that caused by the Owner or other Contractors.

.5 Remove waste materials from the site at regularly scheduled times or dispose of as directed by the Owner's Representative. Do not burn waste materials on site.

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

.7 Leave the work broom clean before the inspection process commences.

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

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

1.5 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Text, schedules and procedures for systematic Waste Management Program for construction, deconstruction, demolition, and renovation projects, including:

.1 Diversion of Materials.

.2 Waste Audit (WA) - Schedule A.

.3 Waste Reduction Workplan (WRW) - Schedule B.

.4 Demolition Waste Audit (DWA) - Schedule C.

.5 Cost/Revenue Analysis Workplan (CRAW) - Schedule D.

.6 Materials Source Separation Program (MSSP).

.7 Canadian Governmental Responsibility for the Environment Resources - Schedule E.

1.2 DEFINITIONS

.1 Demolition Waste Audit (DWA): Relates to actual waste generated from project.

.2 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.3 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.

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

.5 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.6 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

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

.8 Separate Condition: Refers to waste sorted into individual types.

.9 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.

1.3 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by authorities having jurisdiction.

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

.4 Provide containers to deposit reusable and recyclable materials.

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

.6 Locate separated materials in areas which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.

.1 Transport to recycling facility.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Unless specified otherwise, materials for removal become Contractor's property.

.2 Protect, stockpile, store and catalogue salvaged items.

.3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to approved local facility.

.4 Protect structural components not removed for demolition from movement or damage.

.5 Support affected structures. If safety of building is endangered, cease operations and immediately notify Department having jurisdiction.

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

.7 Separate and store materials produced during dismantling of structures in designated areas.

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

.1 On-site source separation is recommended.

1.5 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of any waste into waterways, storm, or sanitary sewers.

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

.4 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.6 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Provide security measures approved by Owner's Representative.

1.7 SCHEDULING

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

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 APPLICATION

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

3.2 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

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

3.3 DIVERSION OF MATERIALS

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

.1 Mark containers or stockpile areas.

.2 Provide instruction on disposal practices.

.2 On-site sale or distribution of salvaged materials to third parties is not permitted.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 74 11 - Cleaning.

.2 Section 01 78 00 - Closeout Submittals.

1.2 FINAL INSPECTION AND DECLARATION PROCEDURES

.1 Contractor's Inspection: The Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects; repair as required. Notify the Owner's Representative in writing of satisfactory completion of the Contractor's Inspection and that corrections have been made. Request an Owner's Representative's Consultant's Inspection.

.2 Owner's Representative's Inspection: Owner's Representative and the Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. The contractor shall correct Work accordingly.

.3 Completion: submit written certificate that the following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, adjusted and balanced and are fully operational.

.4 Operation of systems have been demonstrated to Owner's personnel.

.5 Work is complete and ready for Final Inspection.

.4 Final Inspection: When items noted above are completed, request final inspection of Work by the Owner's Representative and the Contractor. If Work is deemed incomplete by the Owner's Representative, complete outstanding items and request a reinspection.

.5 Declaration of Substantial Performance: When the Owner's Representative considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Certificate of Substantial Performance. Refer to General Conditions for specifics to application.

.6 Commencement of Lien and Warranty Periods: The date of acceptance of the submitted declaration of Substantial Performance shall be the date for commencement for the warranty period and commencement of the lien period.

.7 Declaration of Total Performance: When the Owner's Representative considers final deficiencies and defects have been corrected and it appears requirements of the Contract

have been totally performed, make application for certificate of Total Performance. Refer to General Conditions for specifics to application. If Work is deemed incomplete by the Consultant, complete the outstanding items and request a reinspection.

1.3 REINSPECTION

.1 Should status of work require reinspection by Owner's Representative due to failure of work to comply with Contractor's claims for inspection, Owner will deduct amount of compensation for reinspection services from payment to Contractor.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 As-built, samples, and specifications.

.2 Equipment and systems.

.3 Product data, materials and finishes, and related information.

.4 Operation and maintenance data.

.5 Spare parts, special tools and maintenance materials.

.6 Warranties.

1.2 RELATED SECTIONS

.1 Section 01 45 00- Quality Control.

.2 Section 01 77 00 - Closeout Procedures.

1.3 SUBMISSION

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

.2 Submit one copy of completed volumes in final form 15 days prior to final inspection.

.3 Copy will be returned after final inspection, with Owner's Representative's comments.

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

.5 Two weeks prior to Substantial Performance of the Work, submit to the Owner's Representative, two final copies of operating and maintenance manuals.

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

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

.8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.9 Pay costs of transportation.

1.4 FORMAT

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

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

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

.4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content under Section numbers and sequence of Table of Contents.

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

.7 Text: Manufacturer's printed data, or typewritten data.

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

.9 Provide CAD files in DWG format on CD. Also provide electronic files in PDF format.

1.5 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project; names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties; schedule of products and systems, indexed to content of volume.

.2 For each product or system:

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

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

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

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

.6 Training: Refer to Division 01.

1.6 AS-BUILTS AND SAMPLES

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

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to the Contract.

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

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

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

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

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

.5 Keep record documents and samples available for inspection by Owner's Representative.

1.7 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of blue line opaque drawings, provided by Owner's Representative.

.2 Provide felt tip marking pens, maintaining red color pens for recording information.

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

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

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

.2 Field changes of dimension and detail.

.3 Changes made by change orders.

.4 Details not on original Contract Drawings.

.5 References to related shop drawings and modifications.

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

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

.2 Changes made by Addenda and change orders.

.6 Other Documents: submit manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

.7 At completion of project, provide all recorded information on print drawings. Transfer recorded information to AutoCAD files in DWG format. Submit DWG files, also with electronic files in PDF format as part of the Closeout Submittals.

1.8 EQUIPMENT AND SYSTEMS

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

.2 Panel board circuit directories: provide updated panelboard directories to reflect all changes during construction.

.3 Include installed colour coded wiring diagrams.

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

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

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

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

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

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

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

.11 Include test and balancing reports

.12 Additional requirements: As specified in individual specification sections.

1.9 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

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

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

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

1.10 SPARE PARTS

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

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

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

.4 Receive and catalogue all items. Submit inventory listing to Owner’s Representative. Include approved listings in Maintenance Manual.

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

1.11 MAINTENANCE MATERIALS

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

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

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

.4 Receive and catalogue all items. Submit inventory listing to Owner’s Representative. Include approved listings in Maintenance Manual.

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

1.12 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification section.

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

.3 Deliver to project site place and store.

.4 Receive and catalogue all items. Submit inventory listing to Owner's Representative. Include approved listings in Maintenance Manual.

1.13 STORAGE, HANDLING AND PROTECTION

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

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

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

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

.5 Remove and replace damaged products at own expense and to satisfaction of Owner's Representative.

1.14 WARRANTIES

.1 Provide copy of warranty and include in Operation and Maintenance Manuals.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SECTIONS INCLUDES

.1 Methods and procedures for demolishing, salvaging, recycling and removing sitework items designated to be removed in whole or in part, and for backfilling resulting trenches and excavations.

1.2 RELATED SECTIONS

.1 Section 01 35 43 - Environmental Procedures

.2 Section 01 45 00 - Quality Control

.3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.4 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.3 SUBMITTALS

.1 Shop drawings

.1 Submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.

.2 Submit drawings stamped and signed by qualified professional engineer licensed in Province of Newfoundland and Labrador, Canada.

.2 Hazardous Materials: provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.

.3 Submit plan indicating:

.1 Descriptions of and anticipated quantities of materials to be salvaged, reused, recycled and landfilled.

.2 Schedule of selective demolition.

.3 Number and location of dumpsters.

.4 Anticipated frequency of tippage.

.4 Submit copies of certified weigh bills, bills of landing from authorized disposal sites and reuse and recycling facilities for material removed from upon request from Owner's Representative.

1.4 QUALITY ASSURANCE

.1 Convene pre-installation meeting one week prior to beginning work of this section to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with building subtrades.

.2 Arrange for site visit with Owner's Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.

.3 Hold project meetings every month.

.1 Ensure key personnel, site supervisor, project manager, subcontractor representatives attend.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Owner's Representative and at no cost to Owner's Representative.

.2 Remove and store materials to be salvaged, in manner to prevent damage.

.3 Store and protect in accordance with requirements for maximum preservation of material.

1.6 SITE CONDITIONS

.1 In all circumstances ensure that demolition work does not adversely affect adjacent water courses groundwater and wildlife, or contribute to excess air and noise pollution.

.2 Do not dispose, of waste or volatile materials such as mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout project.

.3 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.

.4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.

.5 Protect trees, plants and foliage on site and adjacent properties where indicated.

1.7 EXISTING CONDITIONS

.1 Prior to start of any demolition work remove contaminated or hazardous materials as defined by authorities having jurisdiction from site and dispose of at designated disposal facilities

1.8 SCHEDULING

.1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.

.2 Notify Owner's Representative in writing when unforeseen delays occur.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 PREPARATION

.1 Inspect site with Owner's Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies before starting demolition.

3.2 REMOVAL OF HAZARDOUS WASTES

.1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

3.3 REMOVAL OPERATIONS

.1 Remove items as indicated.

.2 Do not disturb items designated to remain in place.

.3 Removal of Pavements, Curbs and Gutters

.1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Owner's Representative.

.2 Protect adjacent joints and load transfer devices.

.3 Protect underlying and adjacent granular material.

.4 When removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving, prevent contamination with base course aggregates.

.5 When removing pipes under existing or future pavement area, excavate at least 300mm below pipe invert.

.6 Decommission water wells and monitoring wells in accordance with Provincial guidelines and regulations.

.7 Removal from site

.1 Interim removal of stockpiled material will be required by Owner's Representative, if it is deemed to interfere with operations of Owner's Representative, Owner or other contractors.

.8 Sealing

.1 Seal pipe ends and walls of manholes or catch basins as indicated. Securely plug to form watertight seal.

.9 Backfill

.1 Backfill in areas as indicated

3.4 RESTORATION

.1 Restore areas and existing works outside areas of demolition to match conditions of adjacent, undisturbed areas.

.2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.5 CLEAN UP

.1 Upon completion of work, remove debris, trim surfaces and leave work site clean.

.2 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 74 21 - Construction / Demolition Waste Management and Disposal.

.2 Section 01 78 00 - Closeout Submittals.

1.2 SUBMITTALS

.1 Submittals: in accordance with Division 01.

.2 Shop drawings; submit drawings stamped and signed for approval by Owner's Representative.

.3 Shop drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.4 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.

.5 In addition to transmittal letter referred to in Division 01: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.6 Closeout Submittals:

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

.2 Operation and maintenance manual approved by, and final copies deposited with, Owner's Representative before final inspection.

.3 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.

.4 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.

.5 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.

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Owner’s Representative for approval. Submission of individual data will not be accepted unless directed by Owner’s Representative.

.2 Make changes as required and re-submit as directed by Owner’s Representative.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Owner’s Representative will provide 1 set of reproducible mechanical drawings or AutoCAD files. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Owner's Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Division 01.

1.4 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One glass for each gauge glass.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

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

PART 2 PRODUCTS

2.1 MATERIALS

.1 All materials used on this project shall be new and CSA approved unless noted otherwise.

PART 3 EXECUTION

3.1 PAINTING, REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 23 - Interior Painting.

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

.3 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.1 Perform tests as specified in other sections of this specification.

.2 Manufacturer's Field Services:

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

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

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 DEMONSTRATION

.1 Owner’s Representative will use equipment and systems for test purposes prior to acceptance. Contractor to supply labour, material, and instruments required for testing.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Owner’s Representative may record these demonstrations on video tape for future reference.

3.5 PROTECTION

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

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Thermal insulation for piping and piping accessories in commercial type applications.

1.2 RELATED SECTIONS

.1 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

1.3 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE Standard 90.1, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings (Including all Addenda).

.2 American Society for Testing and Materials (ASTM)

.1 ASTM B209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.

.2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M, Standard Specification for Mineral Fibre-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C533 Standard specification for Calium Silicate Insulation Block and Pipe.

.6 ASTM C547 Standard Specification for Mineral Fibre Pipe Insulation.

.7 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.8 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.9 ASTM D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Department of Justice Canada (Jus)

.1 Canadian Environmental Assessment Act (CEAA), c. 37.

.2 Canadian Environmental Protection Act, (CEPA), c. 33.

.3 Transportation of Dangerous Goods Act (TDGA), c. 34.

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

.1 Material Safety Data Sheets.

.6 Manufacturer's Trade Associations

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

.7 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.8 National Energy Code for Buildings (NECB).

1.4 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - will mean "not concealed" as defined herein.

.2 TIAC ss:

.1 CRF: Commercial Rectangular Finish

.2 CPF: Commercial Piping Finish.

1.5 SUBMITTALS

.1 Submittals: in accordance with Division 01.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Division 01. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Division 01.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Division 01.

.4 Samples:

.1 Submit samples in accordance with Division 01.

.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix label beneath sample indicating service.

.5 Quality assurance submittals: submit following in accordance with Division 01.

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

.2 Instructions: submit manufacturer's installation instructions to Owner's Representative.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: certified in performing work of this Section, and have at least 5 years successful experience in this size and type of project, qualified to standards of TIAC.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Division 01.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.

.2 Storage and Protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

.3 Waste Management and Disposal:

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

.2 Place excess or unused insulation and insulation accessory materials in designated containers.

.3 Divert unused metal materials from landfill to metal recycling facility approved by Owner's Representative.

.4 Dispose of unused adhesive material at official hazardous material collections site approved by Owner's Representative.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 ^{o}C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code A-2: Rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.

.1 Insulation: to ASTM C533.

.2 Maximum "k" factor: to 0.075 W/m ^{o}C @ 500 ^{o}C .

.3 Design to permit periodic removal and re-installation.

.4 TIAC Code A-3: Rigid moulded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

.5 TIAC Code A-6: Flexible unicellular tubular elastomer.

.1 Insulation: with vapour retarder jacket to ASTM C534.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: 0.039 W/m – ^{o}C.

.4 To be certified by manufacturer to be free of potential stress corrosion cracking corrodants

.5 Flame spread index less than 25, and smoke developed index less than 50.

.6 TIAC Code C-2: Mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/ULC-S702.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

2.3 INSULATION SECUREMENT

.1 Tape: Self-adhesive, aluminum, plain reinforced, 50 mm wide minimum.

.2 Contact adhesive: Quick setting.

.3 Canvas adhesive: Washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: Stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

.1 Thermal insulating and finishing cement:

.1 Hydraulic setting or air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 OUTDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2.

2.8 JACKETS

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.

.2 Colours: to match adjacent finish paint. Confirm colour with Owner's Representative.

.3 Minimum service temperatures: -20°C.

.4 Maximum service temperature: 65°C.

.5 Moisture vapour transmission: 0.02 perm.

.6 Thickness: 0.55 mm.

.7 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

.8 Special requirements:

.1 Indoor: flame spread rating 25, smoke developed rating 50.

.2 Outdoor: UV rated material at least 0.5 mm thick.

.2 Canvas:

.1 220gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: Compatible with insulation.

.3 Aluminum:

.1 To ASTM B209.

.2 Thickness: 0.50 mm sheet.

.3 Finish: Embossed or corrugated.

.4 Joining: Longitudinal and circumferential slip joints with 50 mm laps.

.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.

.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

.4 Stainless steel:

.1 Type: 304 or type 316.

.2 Thickness: 0.25 mm.

.3 Finish: Smooth.

.4 Joining: Longitudinal and circumferential slip joints with 50 mm laps.

.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.

.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

2.9 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS

.1 Caulking to: Section 07 92 00 - Joint Sealing.

PART 3 EXECUTION

3.1 MANUFACTURE'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 PRE- INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces to be clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer's instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Install hangers, supports outside vapour retarder jacket.

.5 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 See Section 22 07 16 – Plumbing Equipment Insulation.

3.5 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified. Insulate vent pipes 3.0 m from roof penetration.

.2 TIAC Code: A-2.

.1 Insulation securements: 18 ga SS wire or 12 mm x 0.51 mm SS bands at 300 mm oc.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-H.

.3 TIAC Code: A-3.

.1 Securements: Tape at 300 mm oc.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.4 TIAC Code: A-6.

.1 Insulation securements: as per manufacturer's recommendation.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-CA.

.5 TIAC Code: C-2 with vapour retarder jacket.

.1 Insulation securements: 18 ga SS wire or 12 mm x 0.5 mm SS bands at 300 mm oc.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.6 Thickness of insulation to be as listed in following table.

.1 Run-outs to individual units and equipment not exceeding 4000 mm long.

.2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	**Temp °C**	**TIAC code**	**Pipe sizes (NPS) and insulation thickness (mm)**					
	Run out			***to 1***	***1 1/4 to 2***	***2 1/2 to 4***	***5 to 6***	***8 & over***
Steam	up to 175	A-3	38	50	65	75	90	90
Domestic HWS		A-3	25	25	25	38	38	38
Refrigerated Drinking Water		A-3	25	25	25	25	25	25
Domestic CWS		A-3	25	25	25	25	25	25
RWL and RWP		A-3	25	25	25	25	25	25
Roof Drain Body		C-2	25	25	25	25	25	25
Vent Pipe Plumbing		A-3	25	25	25	25	25	25

.7 Finishes:

.1 Exposed indoors: PVC jacket.

.2 Exposed in mechanical rooms: PVC jacket.

.3 Concealed, indoors: canvas on valves, fittings. No further finish.

.4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.

.5 Outdoors: Water-proof Aluminium, or SS jacket.

.6 Finish attachments: SS screws or bands, at 150 mm oc. Seals: wing or closed.

.7 Installation: To appropriate TIAC code CPF/1 through CPF/5.

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Section 01 78 00 - Closeout Submittals.

.3 Section 22 05 00 – Common Work Results for Plumbing.

.4 Section 22 07 19 – Plumbing Piping Insulation.

.5 Section 33 11 16.01 - Incoming Site Water Utility Distribution Piping.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).

.1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.

.2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.

.3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.2 American National Standards Institute/National Sanitation Foundation (ANSI/NSF).

.1 ANSI/NSF 61, Drinking Water System Components.

.3 American Society for Testing and Materials International (ASTM).

.1 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM A536, Standard Specification for Ductile Iron Castings.

.3 ASTM B 88M, Standard Specification for Seamless Copper Water Tube (Metric).

.4 ASTM F 492, Standard Specification for Propylene and Polypropylene (PP) Plastic-Lined Ferrous Metal Pipe Fittings.

.4 American Water Works Association (AWWA).

.1 AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.2 AWWA C606, Grooved and Shouldered Joints.

.5 Canadian Standards Association (CSA International).

.1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.

.6 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA).

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

.1 Material Safety Data Sheets (MSDS).

.8 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

.1 MSS-SP-67, Butterfly Valves.
.2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
.3 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
.4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.

.9 National Research Council (NRC)/Institute for Research in Construction.

.1 NRCC 38728, National Plumbing Code of Canada (NPC).

.10 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA).

1.3 SUBMITTALS

.1 Submittals in accordance with Division 01.

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Division 02.

.4 Closeout Submittals:

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

.5 Grooved joint couplings and fittings to be indicated on product submittals and to be specifically identified with the applicable style or series designation.

1.4 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Division 01.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

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

.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 CEPA, TDGA , Regional and Municipal regulations.

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

1.6 WARRANTY

.1 Provide a written guarantee, signed and issued in the name of the owner, against defective materials and workmanship for a period of one (1) year from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.

.1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.

.2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

2.2 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI/ASME B16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

.5 NPS2 and larger: roll grooved to CSA B242. Cast bronze to ANSI/ASME B16.18 or wrought copper ANSI/ASME B16.22.

.1 Fittings to be manufactured to copper-tube dimensions. Flaring of tube or fitting ends to accommodate IPS sized couplings is not permitted.

.6 NPS 1 ½ and under: Cast copper, ANSI/ASME B16.18 or wrought copper, ANSI/ASME B16.22; with 301 stainless steel internal components, EPDM seal, and push-to-connect or press fit joints, for hard drawn copper tube type L or K, rated for 1300 kPa at ASTM B88.

2.3 JOINTS

.1 Rubber gaskets, latex-free, 1.6 mm thick: to ANSI/AWWA C111.

.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.

.3 Solder: 95/5 tin copper alloy lead free.

.4 Push-to-connect: EPDM gasket, UL classified in accordance with ANSI/NSF 61 for potable water service.

.5 Teflon tape: for threaded joints.

.6 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket. Gasket to be classified in accordance with ANSI/NSF 61 for potable water service. Couplings to be manufactured to copper-tube dimensions. Flaring of tube or fitting ends to accommodate IPS sized couplings is not permitted.

.7 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F492, complete with thermoplastic liner.

2.4 GATE VALVES

.1 NPS2 and under, soldered:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified In Division 23..

.2 NPS2 and under, screwed:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified in Division 23.

.3 NPS2-1/2 and over, in mechanical rooms, flanged:

.1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim specified in Division 23.

.4 NPS2-1/2 and over, other than mechanical rooms, flanged:

.1 Non-rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet specified in Division 23.

2.5 GLOBE VALVES

.1 NPS2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet as specified in Division 23.

.2 Lockshield handles: as indicated.

.2 NPS2 and under, screwed:

.1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc as specified in Division 23.

.2 Lockshield handles: as indicated.

2.6 SWING CHECK VALVES

.1 NPS 2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified in Division 23.

.2 NPS2 and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified in Division 23.

.3 NPS 2 and under, push-to-connect, lift-disc type:

.1 To MSS-SP-80, 1380 kPa CWP, bronze body, stainless steel disc, spring, and shaft, suitable for installation in horizontal or vertical lines.

.4 NPS2-1/2 and over, flanged:

.1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, or renewable seat, bronze disc, bolted cap specified.

2.7 BALL VALVES

.1 NPS2 and under:

.1 As specified.

2.8 BUTTERFLY VALVES

.1 NPS21/2 and over lug:

.1 To MSS-SP-67, Class 200, 1.4 MPa.

.2 As specified.

.2 NPS21/2 and over, grooved ends:

.1 Class 300, 2.1 MPa as specified.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code and local authority having jurisdiction.

.2 Install pipe work in accordance with Mechanical Division and by certified journeyperson supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Grooved joint couplings and fittings to be installed in accordance with the manufacturer's written installation instructions. Grooved ends to be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets to be verified as suitable for the intended service prior to installation. Gaskets to be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative to provide on-site training for Contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products. The manufacturer's representative to periodically visit the jobsite and review installation. Contractor to remove and replace any joints deemed improperly installed.

.5 Push-to Connect Piping: Prepare copper tube and install in strict accordance with installation instructions. Pipe ends to be cleaned, free from indentations, projections, burrs, and foreign matter. Use a tube preparation tool to clean and make installation mark. Push copper tube into fittings to installation depth mark, per installation instructions. Keep fittings free of dirt and oil.

.6 Install CWS piping below and away from HWS and HWR and other hot piping so as to maintain temperature of cold water as low as possible.

.7 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.8 Buried Tubing

.1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.

.2 Bend tubing without crimping or constriction. Minimize use of fittings.

3.2 VALVES

.1 Isolate equipment, fixtures and branches with butterfly or ball valves.

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.3 PRESSURE TESTS

.1 Conform to requirements of Mechanical Division.

.2 Test pressure: greater of 1 ½ times maximum system operating pressure or 860 kPa.

3.4 FLUSHING AND CLEANING

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory for bacteriological testing to verify that system is clean to Provincial potable water guidelines. Let system flush for additional 2 h, then draw off another sample for testing.

3.5 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that pressure booster systems are operating properly.

.4 Ensure that air chambers, expansion compensators are installed properly.

3.6 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction and approval of Owner’s Representative.

.2 Coordinate with Section 33 11 16 – Site Water Utility Distribution Piping and Section 33 11 16.01 – Incoming Site Water Utility Distribution Piping.

.3 Upon completion, provide laboratory test reports on water quality to Owner’s Representative.

3.7 START-UP

.1 Timing: Start up after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:

.1 Establish circulation and ensure that air is eliminated.

.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.

.3 Bring HWS storage tank up to design temperature slowly.

.4 Monitor HWS and HWR piping systems for freedom of movement, pipe expansion as designed.

.5 Check control, limit safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.8 PERFORMANCE VERIFICATION

.1 Timing:

.1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.

.2 Procedures:

.1 Verify that flow rate and pressure meet Design Criteria.

.2 TAB HWR in accordance with Mechanical Division.

.3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.

.4 Sterilize HWS and HWR systems for Legionella control.

.5 Verify performance of temperature controls.

.6 Verify compliance with safety and health requirements.

.7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut off water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.

.8 Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.

.3 Reports:

.1 In accordance with Division 01: using report forms as specified in Division 01.

.2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for plumbing specialties and accessories.

1.2 RELATED SECTIONS

.1 Section 01 45 00 – Quality Control.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 01 78 00 – Closeout Submittals.

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.2 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA)

.1 AWWA C700, Cold Water Meters-Displacement Type, Bronze Main Case.

.2 AWWA C701, Cold Water Meters-Turbine Type for Customer Service.

.3 AWWA C702, Cold Water Meters-Compound Type.

.3 American National Standards Institute (ANSI)

.1 ANSI Z358.1 Emergency eyewash and shower equipment.

.4 Canadian Standards Association (CSA)

.1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.

.2 CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.5 Health Canada/Workplace Hazardous Materials Information Systems (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.6 Plumbing and Drainage Institute (PDI)

.1 PDI-G101, Testing and Rating Procedure for Grease Interceptors with Appendix of Installation and Maintenance.

.2 PDI-WH201, Water Hammer Arresters Standard.

1.4 SUBMITTALS

.1 Submittals in accordance with Division 01.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.

.2 Indicate dimensions, construction details and materials for specified items.

.3 Submit WHMIS MSDS in accordance with Division 02. Indicate VOC's for adhesive and solvents during application and curing.

.3 Shop Drawings:

.1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories.

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

.5 Instructions: submit manufacturer's installation instructions.

.6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals. Include:

.1 Description of plumbing specialties and accessories, giving manufacturer's name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

1.5 QUALITY ASSURANCE

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

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

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

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

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Owner's Representative.

.5 Fold up metal and plastic banding flatten and place in designated area for recycling.

1.7 WARRANTY

.1 Provide a written guarantee, signed and issued in the name of the owner, against defective materials and workmanship for a period of one (1) year from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 FLOOR DRAINS

.1 Floor drains and trench drains.

.1 FD-1: general duty; cast iron body, round adjustable head, 125 mm, sediment basket nickel bronze strainer, integral seepage pan and clamping collar, trap primer connection.

.1 Acceptable Product: Zurn ZN-415-B5-P, Jay R. Smith, MIFAB, Blücher, Watts.

.2 FD-3: combination funnel floor drain; coated cast iron body with integral seepage pan, clamping collar, nickel-bronze adjustable head strainer with integral oval funnel, trap primer connection.

.1 Acceptable Product: Zurn ZN-415-BF-P, Jay R. Smith, MIFAB, Blücher, Watts.

.3 FD-4: planters; coated cast-iron body with integral seepage pan, clamping collar, vertically adjustable nickel-bronze adjustable head strainer, vandal-proof NPS2 perforated dome and standpipe, stainless steel screen, trap primer connection.

.1 Acceptable Product: Zurn ZN-350 C-P, Jay R. Smith, MIFAB, Blücher, Watts.

2.2 ROOF DRAINS

.1 RD-1; Standard coated roof drain with cast iron body 381 mm diameter, with aluminum dome, under-deck clamp to suit roof construction, flashing clamp ring with integral gravel stop.

.1 Acceptable Product: Zurn Z-100-C, Jay R. Smith, MIFAB, Watts.

.2 RD-2: Cornice, sill or canopy drain; cast iron body with 150 mm diameter cast bronze dome or strainer and flashing clamp, under deck clamp.

.1 Acceptable Product: Zurn Z-181-C, Jay R. Smith, MIFAB, Watts.

.3 RD-3: parapet or scupper drain; cast iron body with 303 mm x 305 mm obligue aluminum strainer/grate and flashing clamp.

.1 Acceptable Product: Zurn, Z-187, Jay R. Smith, MIFAB, Watts.

.4 RD-4: inverted roofing system; cast iron body with aluminum dome, under-deck clamp and sump receiver to suit roof construction, with integral gravel stop and stainless steel drainage grid.

.1 Acceptable Product: Zurn, Jay R. Smith, MIFAB, Watts.

2.3 CLEANOUTS

.1 Cleanout plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

.1 Acceptable Product: Zurn, Jay R. Smith, MIFAB, Blücher, Watts.

.2 Access covers:

.1 Wall access: face or wall type, or stainless steel square cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.

.2 Floor access: round cast iron body and frame with adjustable secured nickel bronze top.

.1 Plugs: bronze with neoprene gasket.

.2 Cover for unfinished concrete floors: cast iron round, gasket, vandal-proof screws.

.3 Cover for terrazzo finish: polished nickel bronze brass with recessed cover for filling with terrazzo, vandal-proof locking screws.

.4 Cover for tile and linoleum floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.

.5 Cover for carpeted floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

2.4 NON FREEZE WALL HYDRANTS

.1 Recessed with integral vacuum breaker, integral backflow preventer, NPS ¾ hose outlet, removable operating key, polished bronze finish, encased, non-freeze, anti-siphon, automatic draining, wall clamp, replaceable bronze seat and washer.

.2 Acceptable Product: Zurn Z-1300-PB-WC, Jay R. Smith, MIFAB, Watts.

2.5 WATER HAMMER ARRESTORS

.1 Stainless steel or copper construction, bellows or piston type: to PDI-WH201.

.2 Acceptable Product: Zurn, Jay R. Smith, MIFAB, Precision Plumbing Products, Watts.

2.6 BACK FLOW PREVENTERS

.1 To CSA-B64 Series.

.2 Application: domestic service entrance and fire protection system service entrance.

.1 Domestic water:

.1 Reduced pressure principle type consisting of a pressure differential relief valve located between two independently operated spring-loaded centre guided check valves.

.2 Ductile iron construction with FDA approved fusion epoxy coat inside and out.

.3 Compound check.

.4 Single access cover.

.5 Maximum temperature range: 0.5ºC to 60ºC.

.6 Maximum pressure: 1205 kPa.

.7 CSA certified.

.8 Acceptable Product: Wilkins Model 375L, Watts, Zurn.

.2 Fire protection water:

.1 Same as above except without compound check and with FM and ULC approval for fire protection service.

.2 Acceptable Product: Wilkins Model 975L, Watts, Zurn.

.3 Application: install on domestic cold water supply to electrode steam humidifier, emergency eyewash and drench shower.

.1 Bronze body construction.

.2 Internal pressure differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs.

.3 Seats and discs replaceable in both check modules and the relief valve.

.4 Assembly to include two resilient seated isolation valves, four resilient seated test cocks, protective wye strainer with 20 mesh screen, union end connections and an air gap drain fitting.

.5 Reduced pressure zone type backflow preventer.

.6 Acceptable Product: Watts Series U-009QT-S complete with Watts Series 909AG air gap, Wilkins, Zurn.

.4 Provide backflow preventer test kit as follows:

.1 Maximum working pressure: 1205 kPa.

.2 Maximum working temperature: 98.8ºC.

.3 0-103 kPa and 0-15 psig dual scale pressure gauge with 114 mm diameter face, ±2% accuracy.

.4 Test valves: two (2) ball valves and one (1) needle valve.

.5 Hoses: three (3) one (1) metre test hoses with female threaded swivel coupling.

.6 Adapters:

.1 Three (3) NPS ¼ threaded coupling adapters.

.2 Three (3) NPS ½ x NPS ¼ bushings.

.3 Three (3) NPS ¾ x NPS ¼ bushings.

.7 400 mm long securing strap.

.8 Moisture resistant instruction guide.

.9 Light weight, shock resistant molded plastic case with foam inserts.

.10 Acceptable Product: Watts No. TK-9A Backflow Preventer Test Kit, Precisions Plumbing Products, MIFAB.

2.7 VACUUM BREAKERS

.1 To CSA-B64 Series.

.2 Atmospheric vacuum breaker, where indicated:

.1 Plain brass body with silicone disc.

.2 Suitable for temperatures up to 82ºC.

.3 Maximum operating pressure: 860 kPa.

.4 Size: as indicated.

.5 Acceptable Product: Watts Series 288a, Wilkins, Jay R. Smith, MIFAB.

.3 Hose connection vacuum breaker:

.1 NPS ¾ female hose thread inlet, NPS ¾ male hose threat outlet, brass finish.

2.8 PRESSURE REGULATORS

.1 Capacity: as indicated.

.1 Inlet pressure: 1034 kPa.

.2 Outlet pressure: 413 kPa.

.3 Capacity: as indicated.

.2 Up to NPS1-1/2 bronze bodies, screwed: to ASTM B62, strainer and stainless steel strainer screen.

.3 NPS2 and over, semi-steel bodies, Class 125, flanged: to ASTM A126, Class B, strainer.

.4 Semi-steel spring chambers with bronze trim.

2.9 BACKWATER VALVES

.1 Coated extra heavy cast iron body with bronze seat, bronze flapper and threaded cover.

.2 Access:

.1 Surface access.

.2 Concrete access pit with steel cover, as indicated.

2.10 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.

2.11 WATER MAKE-UP ASSEMBLY

.1 Complete with backflow preventer, pressure gauge on inlet and outlet, pressure reducing valve to CSA B356, pressure relief valve on low pressure side and gate valves on inlet and outlet, strainer.

2.12 WATER METERS

.1 Displacement type to AWWA C700, Turbine type to AWWA C701, Compound type to AWWA C702.

.2 Capacity: flow rate, pressure drop, pipe connections as indicated.

.3 Accessories: remote readout device, pulse output or 4-20 mA current output.

2.13 TRAP SEAL PRIMERS

.1 Pressure drop actuated:

.1 Brass body construction with inlet opening of ½ male NPT and outlet opening of female ½ NPT.

.2 Provide complete with four-hole view built-in air gap to prevent any backflow from trap being fed into the water supply.

.3 Provide removable inlet filter screen.

.4 Capacity to serve up to four (4) floor drains.

.5 Provide complete with trap seal primer distribution unit as follows:

.1 Brass body construction.

.2 ½ NPT inlet connection.

.3 Four (4) 3/8 FPT brass nipple outlet connections.

.4 Four (4) 6 mm diameter vent holes in lid to provide air gap and backflow protection.

.6 Acceptable Product: MIFAB MR-500 trap seal primer complete with MIFAB MI-DU series distribution unit, Precision Plumbing Products, Zurn, Watts.

.2 Up to 12 floor drains: Electronic trap priming manifold with:

.1 Vacuum breaker

.2 Pre-set 24 hour time clock

.3 Manual override switch

.4 120V solenoid valve

.5 120V or 3 wire connection.

.6 NPS ¾ inlet connection.

.7 Calibrated manifold.

.8 Water hammer arrestor

.9 Mounted in steel cabinet

.10 Compression outlet fittings

.11 Inlet shut off valve

.12 Supplies minimum 59 ml @ 138 kPa.

.3 Trap guard:

.1 All elastomeric normally closed trap guard device utilizes a normally closed seal to prevent evaporation of the trap seal and to protect against sewer gases from backing up into habitable areas. It opens with fluid flow and allows liquid drainage to flow through into the building drain.

2.14 STRAINERS

.1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.

.2 NPS2 and under, bronze body, screwed ends, with brass cap, tapped blowoff and plug.

.3 NPS2½ and over, cast iron body, flanged ends, with bolted cap, tapped blow off connection with bronze ball valve.

2.15 GREASE INTERCEPTORS

.1 Dura coated interior and exterior fabricated steel low type grease interceptors rated as indicated with grease holding capacity as indicated. Unit shall be supplied complete with internal air relief bypass, bronze cleanout plug and trap seal with removable combination pressure equalizer/flow diffusing baffles, gasketted secured cover.

.2 Provide optional enzyme port in cover.

.3 Provide internal or external flow control for field installation. External flow control with orifice sized to suit rated flow as outlined above. External flow control to have inlet/outlet connections as indicated.

.4 Supply grease interceptor with one (1) year supply of poly-enzyme.

.5 Grease interceptor shall carry the PDI label.

.6 Acceptable Product: Zurn Low Profile Grease Interceptor size as indicated, Jay R. Smith, MIFAB, Watts.

2.16 ACID DILUTION DEVICES

.1 Chemical dilution tank:

.1 Chemical dilution tanks to be constructed of seamless natural linear low density polyethylene resins. Tank to have uniform wall thickness and be free of any stresses.

.2 Tanks to be provided complete with side inlet/outlet connections.

.3 Tanks to be supplied with side plumbing vent connection.

.4 Each tank inlet/outlet to accept connection to corrosion resistant drainage piping system utilizing threaded male adaptor and mechanical joint connections.

.5 Tanks to be provided with bolted cover complete with vapour tight cover gasket pre-cut to cover bolt hole pattern.

.6 Connections: as indicated.

.7 Size (total volume, not effective volume):

.1 As indicated.

.8 Dilution tank overall height and diameter to be as follows:

.1 As indicated.

.9 Dilution tank inlet/outlet location on tank will be field determined by Contractor after rough-in of chemical resistant waste piping.

.10 Acceptable Product: Watts/Orion, PEGAS, Town and Country, Zurn Z9A-NT.

.2 Chemical dilution tank sediment interceptor:

.1 Chemical dilution tank sediment interceptors to be constructed of seamless natural linear low density polyethylene resins. Tanks to have uniform thickness and be free of any stresses.

.2 Tanks to be provided complete with side inlet/outlet connections.

.3 Tanks to be supplied without plumbing vent connection.

.4 Each tank inlet/outlet to accept connection to corrosion resistant drainage piping system utilizing male threaded adaptor and mechanical joint connections.

.5 Tanks to be provided complete with bolted cover complete with vapour tight cover gasket pre-cut to cover bolt hole pattern.

.6 Connections: as indicated.

.7 Sizes (total tank volume, not solids retained in basket):

.1 Capacity: as indicated.

.8 Sediment interceptor overall height and diameter as indicated.

.9 Sediment interceptor inlet/outlet location on tank wall to be field determined by Contractor after rough-in of chemical resistant waste piping.

.10 Sediment interceptor to be fully recessed in pre-formed concrete pit constructed by the General Contractor. The General Contractor is to be responsible to supply cover over pit to accommodate pedestrian traffic.

.11 Sediment interceptor solids baskets shall consist of a perforated polyethylene liner with 4.7 mm diameter perforations.

.12 The General Contractor to be responsible to fabricate and install steel frame structure to support sediment interceptor if required to facilitate connection to dilution tank at proper invert.

.13 Acceptable Product: Watts/Orion Sediment Interceptor, PEGAS, Town and Country, Zurn Z9A-SI.

2.17 COMBINATION EMERGENCY DRENCH SHOWER/EYEWASH UNIT (BARRIER FREE)

.1 Bowl: 254 mm diameter corrosion resistant stainless steel bowl.

.2 Shower head: 254 mm diameter corrosion resistant stainless steel shower head.

.3 Pipe and fittings: galvanized steel with protective yellow safety coating.

.4 Operation:

.1 Shower: pull rod with triangular handle.

.2 Eyewash: large, highly visible push handle.

.5 Pipe and Fittings: Schedule 40, stainless steel, complete with orange of yellow polyethylene cover on vertical piping for high visibility and corrosion resistance.

.6 Water supply: NPS 1/2.

.7 Waste: NPS 1 ¼.

.8 Shower valve: chrome-plated NPS 1 stay-open ball valve.

.9 Eyewash valve: chrome-plated NPS ½ stay-open ball valve.

.10 Eyewash spray head assembly: chrome-plated brass spray head assembly with twin, soft flow, eyewash heads and protective sprayhead covers. Integral flow control to ensure safe, steady flow under varying water supply conditions.

.11 Identification sign: 355 mm x 90 mm sign for wall mounting. Sign to read "**EMERGENCY DRENCH SHOWER/EYEWASH UNIT**".

.12 Location: as indicated.

.13 Acceptable Product: Bradley Model S19-310BF, HAWS, Guardian.

2.18 EMERGENCY EYEWASH AND COMBINATION EMERGENCY DRENCH SHOWER/EYEWASH THERMOSTATIC MIXING VALVE

.1 To ANSI Z358.1.

.2 Liquid-filled thermal motor and piston control mechanism with positive shut-off of hot water when cold water supply is lost to prevent scalding.

.3 Valve shall allow cold water flow in the event of loss or interruption of the hot water supply or thermostatic failure.

.4 Vandal-resistant temperature adjustment.

.5 Rough bronze finish.

.6 Temperature range: 18ºC to 35ºC.

.7 Accuracy: ±1.67ºC.

.8 Maximum operating pressure: 860 kPa.

.9 Maximum inlet temperature: 82ºC.

.10 Provide complete with dial thermometer.

.11 Check stops on inlet of hot/cold.

.12 Provide complete with 18 gauge surface mounted stainless steel enclosure. Dimension of enclosure to be 610 mm high x 578 mm wide x 165 mm deep.

.13 Capacity: 98.5 L/min at 310 kPa differential pressure with a cold flow bypass capacity of 50.0 L/min at 310 kPa differential pressure.

.14 Application: emergency fixtures as indicated.

.15 Acceptable Product: Bradley S19-2100-SS, Powers, HAWS, Guardian.

2.19 EMERGENCY EYEWASH THERMOSTATIC MIXING VALVE

.1 Same as thermostatic mixing valve specified in Item 2.18 except for the following:

.1 Wall enclosure dimensions to be 318 mm high x 279 mm wide x 165 mm deep.

.2 Capacity: 35.6 L/min at 310 kPa differential pressure with a cold flow bypass capacity of 25.7 L/min at 310 kPa differential pressure.

.2 Acceptable Product: Bradley S19-2000-SS, Powers, Haws, Guardian, Lawler 911.

2.20 EMERGENCY EYEWASH FIXTURE - PEDESTAL MOUNTED (BARRIER FREE)

.1 Application: as indicated.

.2 Bowl: 254 mm diameter corrosion resistant stainless steel bowl.

.3 Face spring ring: chrome plated circular spray ring to provide supplemental face spray. Provide complete with flow control to ensure adequate flow from eyewash nozzles and face spray ring.

.4 Spray Head Assembly: Chrome plated brass spray head assembly with twin, soft flow, eye wash heads and protective spray head covers. The integral flow control shall ensure safe, steady flow under varying water supply conditions.

.5 Valve: chrome plated brass, NPS ½ stay-open ball valve.

.6 Operation: hand operated by a large, highly visible safety yellow PVC push handle.

.7 Waste: Dome type strainer and NPS 1 ¼ drain fitting furnished.

.8 Water Supply: NPS ½.

.9 Pipe and fittings: galvanized steel with protective yellow safety coating.

.10 Identification sign: 355 mm x 90 mm sign for wall mounting. Sign to read "**EMERGENCY EYEWASH FOUNTAIN**".

.11 Acceptable Product: Bradley Model S19-210BF complete with options indicated, HAWS, Guardian.

2.21 PIPE WALL AND FLOOR PENETRATION SEAL

.1 Application:

.1 Pipes penetrating exterior concrete walls below grade and concrete floors on grade.

.2 Seal material to be EPDM.

.3 Pressure plates to be glass-reinforced plastic.

.4 Bolts and nuts to be stainless steel 18-8.

.5 Suitable temperature range to be -40ºC to 121ºC.

.6 Wall sleeves to be Schedule 40 black iron pipe. Sleeves in exterior walls to be galvanized.

.7 Floor sleeves to be Schedule 40 black iron pipe.

.8 Wall and floor sleeves to be sufficiently long to mount flush with interior and exterior walls and flush with finished floor of slab-on-grade floors, 50 mm above floor, for floors above grade.

.9 Acceptable Product: Metraseal MS Series, Link Seal.

2.22 DOMESTIC CLOTHES WASHER SUPPLY FITTING

.1 To control both hot and cold water simultaneously.

.2 "Finger-tip" lever operation.

.3 Bronze body construction with NPT ½ copper connections and satin chrome finish.

.4 Provide complete with mini water hammer arrestor on hot and cold.

.5 Mount in 300 mm x 300 mm x 100 mm deep stainless steel valve box, 16 gauge, #4 finish. Provide less access door and complete with back in box.

.6 Acceptable Product: Watts Duo-Cloz Model No. 2-M2-SC complete with Watts Model No. 05-H mini water hammer arrestor on hot and cold and entire assembly mounted in a MIFAB Model MI-VB stainless steel valve box, Precision Plumbing Products, MIFAB.

2.23 TEMPERED WATER ASSEMBLY

.1 Quantity: as indicated

.2 Hi/Lo combination assembly mounted in wall mounted (surface) stainless steel cabinet.

.3 Capacity:

.1 High capacity: as indicated @ 310 kPa differential pressure (maximum flow).

.2 Low capacity: as indicated @ 34 kPa differential pressure (minimum flow).

.4 Provide check stops on hot/cold water inlet to each valve.

.5 Provide a pressure regulating valve that responds to varying flow requirements.

.6 Each tempered water valve to be thermostatic mixing type with liquid filled thermostatic motors that sense and control water temperature.

.7 Assembly shall be capable of maintaining water temperature to within 8ºC above setpoint within the range of 4ºC to 71ºC.

.8 Valves to be bronze body.

.9 Valves to be ASSE and CSA approved.

.10 Provide pressure gauges on inlet/outlet of high capacity valve.

.11 Provide dial thermometer at discharge of tempered water assembly.

.12 Acceptable Product: Powers Hydroguard Simmons, RADA Mechanical Products Ltd., Lawler Master Controller Or approved equal.

2.24 POTABLE WATER THERMAL EXPANSION TANK

.1 Quantity: as indicated.

.2 Application: absorb expanded water from domestic hot water tanks because of the inability to expand back into the Town potable water system due to the presence of a backflow preventer on the incoming water supply to the building.

.3 ASME Section VIII construction and label.

.4 FDA approved butyl bladder.

.5 1NPT stainless steel system connection.

.6 Standard tire air charging valve connection.

.7 1033 kPa maximum working pressure.

.8 Vertical tank, floor mounted.

.9 Dimensions: as indicated.

.10 Tank volume: as indicated.

.11 Acceptance volume: as indicated.

.12 Red primer exterior finish.

.13 Air pre-charge to be adjusted in field by the Mechanical Contractor to equal the residual cold water pressure on the discharge side of the pressure reducing valve on the domestic water service entrance by the Mechanical Contractor.

.14 Acceptable Product: ExpanFlex, Amtrol, Taco, S. A. Armstrong, Bell and Gossett, Zurn, Wilkins Series WXTP, Watts.

2.25 COMBINATION EMERGENCY DRENCH SHOWER/EYEWASH UNIT FLOW SWITCH ALARM SYSTEM

.1 Suitable for connection to drench shower with NPS 1-1/2 inlet piping rated for a flow of 1.89 L/s.

.2 System to be fully grounded and electrically insulated from water piping for safety.

.3 Power supply: 120/1/60 with 0.5 amp current draw.

.4 Electrical connection: Pre-wired 1800 mm long multiple conductor, quick connect, waterproof cable for easy connection to the alarm assembly.

.5 Flow Switch: UL listed and CSA approved. Watertight and completely assembled for easy hook-up to alarm assembly.

.6 Strobe light: UL Listed and CSA approved. Light intensity to be 258,000 maximum effective candella on horizontal axis. Safety amber-colored glass complete with dust cover. All solid state components with no moving parts for maintenance-free operation.

.7 Audible Horn: UL listed, externally adjustable from 78-103 decibels at 3.0 meters. Horn designed to sound away from the injured person.

.8 On/Off Switch: Enables horn to be turned off while the strobe light continues to flash and the water flows.

.9 Provide complete with one (1) year warranty.

.10 Acceptable Product: Bradley Model S19-320, HAWS, Guardian.

2.26 EMERGENCY EYEWASH FLOW SWITCH ALARM SYSTEM

.1 Suitable for connection to emergency eyewash with NPS ½ inlet piping rated for a flow of 0.32 L/s.

.2 Alarm horn and strobe light to be wall-mounted above and to side of emergency eyewash. Ensure audible horn points away from injured person.

.3 Construction: Same as Item 2.25, except flow switch sized as per Item 2.26.1 above.

.4 Acceptable Product: Bradley Model S19-320A, HAWS, Guardian.

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 data sheet.

3.2 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code , and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

.1 In addition to those required by code, and as indicated, install at base of soil and waste stacks, and rainwater leaders.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS4.

3.4 NON FREEZE WALL HYDRANTS

.1 Install 600 mm above finished grade unless otherwise indicated.

3.5 WATER HAMMER ARRESTORS

.1 Install on branch supplies to fixtures or group of fixtures where indicated.

3.6 BACK FLOW PREVENTORS

.1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.

.1 Reduced pressure type where backflow would constitute a health hazard.

.2 Double check type where backflow would constitute a nuisance or be aesthetically objectionable or material which would not constitute a health hazard.

.2 Pipe discharge to terminate over nearest drain and or service sink.

3.7 BACKWATER VALVES

.1 Install in main sewer lines where indicated.

.2 Install in access pit as indicated.

3.8 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.9 TRAP SEAL PRIMERS

.1 Install for floor drains and elsewhere, as indicated.

.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Owner's Representative.

.3 Install Type K soft copper tubing to floor drain.

3.10 STRAINERS

.1 Install with sufficient room to remove basket.

3.11 GREASE INTERCEPTORS

.1 Install with sufficient space, as indicated, for ease of maintenance.

3.12 WATER METERS

.1 Install water meter provided by local water authority.

.2 Install water meter as indicated.

3.13 WATER MAKE-UP ASSEMBLY

.1 Install on valved bypass.

.2 Pipe discharge from relief valve to nearest floor drain.

3.14 CHEMICAL DILUTION TANK

.1 Install with sufficient space, as indicated, for ease of maintenance.

3.15 CHEMICAL DILUTION TANK SEDIMENT INTERCEPTOR

.1 Install with sufficient space, as indicated, for ease of maintenance.

3.16 START-UP AND COMMISSIONING

.1 General:

.1 In accordance with Division 01: supplemented as specified herein.

.2 Timing: Start-up only after:

.1 Pressure tests have been completed.
.2 Disinfection procedures have been completed.
.3 Water treatment systems operational.

.3 Provide continuous supervision during start-up.

3.17 TESTING AND ADJUSTING

.1 General:

.1 In accordance with Division 01 : supplemented as specified herein.

.2 Timing:

.1 After start-up deficiencies rectified.
.2 After certificate of completion has been issued by authority having jurisdiction.

.3 Application tolerances:

.1 Pressure at fixtures: +/- 70 kPa.
.2 Flow rate at fixtures: +/- 20%.

.4 Adjustments:

.1 Verify that flow rate and pressure meet design criteria.
.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.5 Floor drains:

.1 Verify operation of trap seal primer.
.2 Prime, using trap primer. Adjust flow rate to suit site conditions.
.3 Check operations of flushing features.
.4 Check security, accessibility, removeability of strainer.
.5 Clean out baskets.

.6 Vacuum breakers, backflow preventers, backwater valves:

.1 Test tightness, accessibility for O&M of cover and of valve.

.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.

.3 Verify visibility of discharge from open ports.

.7 Roof drains:

.1 Check location at low points in roof.

.2 Check security, removeability of dome.

.3 Adjust weirs to suit actual roof slopes, meet requirements of design.

.4 Clean out sumps.

.5 Verify provisions for movement of roof systems.

.8 Access doors:

.1 Verify size and location relative to items to be accessed.

.9 Cleanouts:

.1 Verify covers are gas-tight, secure, yet readily removable.

.10 Water hammer arrestors:

.1 Verify proper installation of correct type of water hammer arrester.

.11 Wall, Ground hydrants:

.1 Verify complete drainage, freeze protection.

.2 Verify operation of vacuum breakers.

.12 Pressure regulators, PRV assemblies:

.1 Adjust settings to suit locations, flow rates, pressure conditions.

.13 Strainers:

.1 Clean out repeatedly until clear.

.2 Verify accessibility of cleanout plug and basket.

.3 Verify that cleanout plug does not leak.

.14 Grease interceptors:

.1 Activate, using manufacturer's recommended procedures and materials.

.15 Hose bibbs, sediment faucets:

.1 Verify operation and at all low points.

.16 Hydronic system water Make-up Assembly:

.1 Verify operation.

.17 Water meters:

.1 Verify calibration certificate.

.18 .Dilution Tank:

.1 Install as per manufacturer's instructions.

.2 Fill with limestone chips.

.19 Tempered water assemblies:

.1 Verify operation of Hi/Lo tempered water assemblies at both high and low flow conditions.

.2 Verify proper discharge temperature setpoint for all tempered water assemblies including those serving emergency fixtures.

.20 Commissioning Reports:

.1 In accordance with Division 01: supplemented as specified herein.

.21 Training:

.1 In accordance with Division 01: supplemented as specified herein.

.2 Demonstrate full compliance with Design Criteria.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).

.2 Canadian Standards Association (CSA International)

.1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A3000, Cementitious Materials Compendium.

1.2 QUALITY ASSURANCE/REGULATORY REQUIREMENTS

.1 Shore and brace excavations, protect slopes and banks and perform all work in accordance with Provincial and Municipal regulations whichever is more stringent.

.2 Comply with Explosives Act of Canada.

.3 Perform blasting in accordance with Provincial and Municipal regulations. Repair damage to approval of Owner's Representative.

.4 No blasting will be permitted within 3 m of any building and where damage would result.

1.3 TESTS AND INSPECTIONS

.1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Owner's Representative.

.2 Not later than one week before backfilling or filling, provide to designated testing agency, 23 kg sample of backfill for fill material proposed for use.

.3 Do not begin backfilling or filling operations until material has been approved for use by Owner's Representative.

.4 Not later than 48 hours before backfilling or filling with approved material, notify Owner's Representative so that compaction tests can be carried out by designated testing agency.

.5 Before commencing work, conduct, with Owner's Representative, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

1.4 EXISTING CONDITIONS

.1 Examine soil report available from Owner's Representative.

.2 Before commencing work verify the location of all buried services on and adjacent to the site.

.3 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.

.4 Remove obsolete buried services within 2 m of foundations. Cap cut-offs.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Granular B-Type I, B-Type II, Select Subgrade to OPSS1010. Sand to OPSS1004.

.2 Crushed Granular to CCDG14.02.

.3 Unshrinkable fill: proportioned and mixed to provide:

.1 Maximum compressive strength of 0.4 MPa at 28 days.
.2 Maximum Portland cement content of 25 kg/m^3.
.3 Minimum strength of 0.07 MPa at 24 h.
.4 Concrete aggregates: to CSA-A23.1/A23.2,
.5 Cement: to CSA A3000, Type GU.
.6 Slump: 160 to 200 mm.

PART 3 EXECUTION

3.1 PROTECTION/PROTECTION

.1 Protect excavations from freezing.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Owner's Representative's Consultants approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

3.2 CLEARING AND GRUBBING

.1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.

.2 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.

.3 Dispose of cleared and grubbed material off site daily to disposal areas acceptable to authority having jurisdiction.

3.3 EXCAVATION

.1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial regulations.

.2 Perform blasting in accordance with Provincial regulations: repair damage as directed by Owner's Representative.

.3 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.

.1 Stockpile topsoil on site for later use.

.4 Excavate as required to carry out work, in all materials met.

.1 Do not disturb soil or rock below bearing surfaces.

.2 Notify Owner's Representative when excavations are complete.

.3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work. Excavation taken below depths shown without Owner's Representative written authorization to be filled with concrete of same strength as for footings at Contractor's expense.

.5 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.

.1 Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.

.6 Excavate for slabs and paving to subgrade levels.

.1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.4 BACKFILLING

.1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Owner's Representative.

.2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.

.3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.

.4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill.

.1 Fill excavated areas with selected subgrade material or gravel and sand compacted as specified for fill.

.5 Placing:

.1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.

.6 Compaction: compact each layer of material to following densities for material to ASTM D698,

.1 To underside of basecourses: 95%.

.2 Basecourses: 100%.

.3 Elsewhere: 90%.

.7 In trenches:

.1 Up to 300 mm above pipe or conduit: sand placed by hand.

.2 Over 300 mm above pipe or conduit: native material approved by Owner's Representative.

.8 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.

.9 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material.

.10 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

.11 Underground tanks: use sand to bottom of granular basecourses or to bottom of topsoil, as applicable.

3.5 GRADING

.1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by the Owner's Representative.

.1 Grade to be gradual between finished spot elevations shown on drawings.

3.6 SHORTAGE AND SURPLUS

.1 Supply all necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.

.2 Dispose of surplus material off site.

3.7 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This Section defines correction to maximum dry density to take into account aggregate particles larger than 4.75 mm.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C127-88, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.

.2 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600kN-m/m³).

.3 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).

.4 ASTM D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

1.3 DEFINITIONS

.1 Corrected maximum dry density is defined as:

.1 D =(D1xD2)(F1 x D2) + (F2 x D1)

.2 Where: D = corrected maximum dry density kg/m^3.

.1 F1 = fraction (decimal) of total field sample passing 4.75 mm sieve.

.2 F2 = fraction (decimal) of total field sample retained on 4.75 mm sieve (equal to 1.00 - F1)

.3 D1 = maximum dry density, kg/m3of material passing 4.75 mm sieve determined in accordance with Method A C of ASTM D698.

.4 D2 = bulk density, kg/m3, of material retained on 4.75 mm sieve, equal to 1000G where G is bulk specific gravity (dry basis) of material when tested to ASTM C127.

.3 For free draining aggregates, determine D1 (maximum dry density) to ASTM D4253, dry method when directed by Owner's Representative.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.2 Section 32 11 16.01 – Granular Sub Base.

.3 Section 32 11 23 – Aggregate Base Courses.

.4 Section 32 12 16.02 – Asphalt Paving for Building Sites.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM International).

.1 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.3 SOURCE QUALITY CONTROL

.1 Source of materials to be incorporated into work or stockpiles requires approval.

.2 Inform Owner's Representative of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.

.3 If, in opinion of Owner's Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.4 Should a change of material source be proposed, advise Owner's Representative 4 weeks in advance of proposed change to allow sampling and testing.

.5 Acceptance of material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if its field performance is found to be satisfactory.

1.4 SAMPLES

.1 Aggregate will be subject to continual sampling by Owner's Representative during production.

.2 Provide Owner's Representative with access to source and processed material for sampling and testing.

.3 Bear the cost of sampling and testing of aggregates which fail to meet specified requirements.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.

.2 Flat and elongated particles of coarse aggregate: to ASTM D4791.

.1 Greatest dimension to exceed five times least dimension.

.3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

.1 Natural sand.

.2 Manufactured sand.

.3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:

.1 Crushed rock or slag.

.2 Gravel and crushed gravel composed of naturally formed particles of stone.

PART 3 EXECUTION

3.1 TOPSOIL STRIPPING

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

.2 Commence topsoil stripping of areas as indicated after area has been cleared and removed from site.

.3 Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.

.4 Stockpile in locations as directed by Owner’s Representative. Stockpile height not to exceed 2.0 m.

3.2 DEVELOPMENT OF AGGREGATE SOURCE

.1 Contractor to produce aggregates off site.

.2 Contractor to develop aggregate source to prevent contamination of aggregates stockpiled.

3.3 PROCESSING

.1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

.2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Owner's Representative.

.3 Wash aggregates, if required to meet specifications. Use only equipment approved by Engineer /Architect.

.4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

3.4 HANDLING

.1 Handle and transport aggregates to avoid segregation, contamination and degradation.

3.5 STOCKPILING

.1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Owner's Representative. Do not stockpile on completed pavement surfaces.

.2 Stockpile aggregates in sufficient quantities to meet Project schedules.

.3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

.4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into work.

.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Owner's Representative within two (2) working days of rejection.

.7 Stockpile materials in uniform layers of thickness as follows:

- .1 Max 1.0 m for coarse aggregate and base course materials.
- .2 Max 2.0 m for fine aggregate and sub-base materials.
- .3 Max 1.5 m for other materials.

.8 Complete each layer over entire stockpile area before beginning next layer.

.9 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.10 Do not cone piles or spill material over edges of piles.

.11 Do not use conveying stackers.

.12 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.6 CLEANING

.1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.2 Leave any unused aggregates in neat compact stockpiles as directed by Owner's Representative.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 31 23 16.26 - Rock Removal.

.2 Section 31 23 33.01 - Excavation, Trenching and Backfilling.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m^3),

1.3 EXISTING CONDITIONS

.1 Examine subsurface investigation report which is available for inspection from Owner's Representative.

.2 Known underground and surface utility lines and buried objects are as indicated on site plan.

.3 Refer to dewatering in Section 31 23 33.01 - Excavating Trenching and Backfilling.

1.4 PROTECTION

.1 Protect and/or transplant existing fencing trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as directed by Owner's Representative. If damaged, restore to original or better condition unless directed otherwise.

.2 Maintain access roads to prevent accumulation of construction related debris on roads.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Fill material: Type 3 in accordance with of Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Excavated or graded material existing on site may be suitable to use as fill for grading work if approved by Owner's Representative.

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Owner's Representative.

.2 Commence topsoil stripping of areas as indicated after area has been cleared of brush, weeds and grasses and removed from site.

.3 Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.

.4 Stockpile in locations as directed by Owner's Representative. Stockpile height not to exceed 2 m.

.5 Dispose of unused topsoil as directed by Owner's Representative.

3.2 GRADING

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.

.2 Rough grade to following depths below finish grades:

.1 250mm for concrete slabs and walks precast paving units.

.3 Slope rough grade away from building 1:50 minimum.

.4 Grade ditches to depth as indicated.

.5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.6 Compact filled and disturbed areas to corrected maximum dry density to ASTM D698, as follows:

.1 85% under landscaped areas.

.2 95% under paved and walk areas.

.7 Do not disturb soil within branch spread of trees or shrubs to remain.

3.3 TESTING

.1 Inspection and testing of soil compaction will be carried out by testing laboratory designated by Owner's Representative. Refer to 01 45 00 – Quality Control.

.2 Submit testing procedure, frequency of tests, to Owner's Representative for approval.

3.4 SURPLUS MATERIAL

.1 Remove surplus material and material unsuitable for fill, grading or landscaping as directed by Owner's Representative.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 56 00 - Temporary Barriers and Enclosures.

.2 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 DEFINITION

.1 Rock: any solid material in excess of 1.0m^3 and which cannot be removed by means of mechanical excavating equipment having 0.95 to 1.15m^3 bucket. Frozen material not classified as rock.

.2 PPV: peal particle velocity.

1.3 MEASUREMENT PROCEDURES

.1 Mass rock:

.1 Rock quantities will be taken from cross section showing original rock surface and actual grade line set by Owner's Representative, except that minimum depth or rock required to excavated to be considered as 300 mm.

.2 Volume of individual boulders and rock fragments will be determined by measuring three maximum mutually perpendicular dimensions.

.2 Trench rock: rock quantities measured will be actual volume removed within following limits:

.1 Width for trench excavation as indicated.

.2 Width for excavation for structures to be bounded by vertical planes up to 500 mm outside and parallel to neat lines for footings as indicated.

.3 Depth from rock surface elevations immediately prior to excavation, to elevation as indicated.

.4 Where design elevation is less than 300 mm below original rock surface depth will be considered to be 300 mm blow original rock surface.

.3 Replacement imported fill: Imported fill quantities will be measured in cubic metres, compacted in place.

.4 Quantities for measurement purposes are indicated in Tender Form. If no quantities are provided, rock removal and fill replacement considered inclusive to the work and will not be measured.

.5 Contractors shall provide all survey equipment needed and provide assistance to Owner's Representative in taking cross sections. Sections shall be taken at 5 m intervals for mass

and trench rock excavation. Sections will be submitted to contractor's site representative for verification. Additional sections shall be taken at points or significant change in elevation or at any other locations as determined by Owner's Representative. Contractor to schedule work to allow sufficient time for Owner's Representative to take necessary sections.

1.4 SUBMITTALS

.1 Blasting Operation

.1 Submit to Owner's Representative and local authorities having jurisdiction for approval, written proposal of operations for removal of rock by blasting.

.2 Indicate proposed method of carrying out work, types and quantities of explosives to be used, loading charts and drill hole patterns, type of caps, blasting techniques, blast protection measures for items such as flying rock, vibration, dust and noise control. Include details on protective measures, time of blasting and other pertinent details.

.3 Submit records to Owner's Representative at end of each shift. Maintain complete and accurate records for drilling and blasting operations.

.4 Prior to any blasting operations, the contractor shall carry out a pre-blast survey. This survey will be conducted by an independent agency. The survey report will be submitted to the Owner's Representative for review.

.5 No blasting shall take place without a minimum of two (2) working days notice to the Owner's Representative.

1.5 QUALIFICATIONS

.1 Retain licensed explosives expert to program and supervise blasting work, to interpret recommendations of pre-blasting report, and to determine precautions, preparation and operations techniques.

1.6 BLASTING AND VIBRATION CONTROL

.1 Reduce ground vibrations to avoid damage to structures or remaining rock mass.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 PROTECTION

.1 Prevent damage to surroundings and injury to persons in accordance with Section 01 56 00 - Temporary Barriers and Enclosures. Sound warnings and display signs when blasting to take place.

3.2 ROCK REMOVAL

.1 Co-ordinate this Section with Section 01 35 29.06 - Health and Safety Requirements.

.2 Remove rock to alignments, profiles, and cross sections as indicated.

.3 Explosive blasting is not permitted at locations indicated.

.4 Do blasting operations in accordance with local and provincial codes, requirements of authority having jurisdiction.

.5 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and to avoid damage to adjacent structures.

.6 Excavate rock to horizontal surfaces.

.7 Scale, pressure wash and broom clean rock surfaces which are to bond to concrete.

.8 Excavate trenches to lines and grades to minimum of 300 mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along barrel of pipe.

.9 Cut trenches to widths as indicated.

.10 Use pre-shearing, cushion blasting or other smooth wall drilling and blasting techniques directed by Owner's Representative.

.11 Remove boulders and fragments which may slide or roll into excavated areas.

.12 Correct unauthorized rock removal at no extra cost, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.3 ROCK DISPOSAL

.1 Dispose of surplus removed rock off site. Dispose in locations acceptable to authorities having jurisdiction and Owner's Representative.

.2 Do not dispose removed rock into landfill. Material must be sent to appropriate location as approved by the Owner's Representative.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 35 43 - Environmental Procedures.

.2 Section 01 56 00 - Temporary Barriers and Enclosures.

.3 Section 31 05 16 – Aggregate Materials.

.4 Section 31 22 13 – Rough Grading.

.5 Section 31 23 16.26 – Rock Removal.

.6 Section 33 11 16 - Site Water Utility Distribution Piping.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM).

.1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).

.5 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).

.6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.

.2 CA/CGSB-8.2, Sieves, Testing, Woven Wire, Metric

.3 Canadian Standards Association (CSA)

.1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA-A3001, Cementitious Materials for Use in Concrete.

.2 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/ Methods of Test and Standard Practices for Concrete.

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock excavation: excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1 m^3. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Unclassified excavation: excavation of deposits of whatever character encountered in work.

.3 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.4 Waste material: excavated material unsuitable for use in work or surplus to requirements.

.5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.

.6 Unsuitable materials:

.1 Weak and compressible materials under excavated areas.

.2 Frost susceptible materials under excavated areas.

.3 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	%Passing
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
0.005 mm	0-45

.2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

1.4 SUBMITTALS

.1 Inform Owner's Representative at least 4 weeks prior to commencing work, of proposed source of fill materials and provide access for sampling.

.2 Submit 70 kg samples of type of fill specified including representative samples of excavated material.

.3 Ship samples as directed by Owner's Representative in tightly closed containers to prevent contamination.

1.5 QUALITY ASSURANCE

.1 Submit design and supporting data at least 2 weeks prior to commencing work.

.2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the province of Newfoundland and Labrador.

.3 Keep design and supporting data on site.

.4 Engage services of qualified professional engineer who is registered or licensed in Province of Newfoundland and Labrador to design and inspect cofferdams, shoring, bracing and underpinning required for work.

.5 Do not use soil material until written report of soil test results are reviewed and approved by Owner's Representative.

1.6 EXISTING CONDITIONS

.1 Buried services:

.1 Before commencing work verify location of buried services on and adjacent to site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.

.3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.5 Prior to commencing excavation work, notify applicable Owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.

.6 Confirm locations of buried utilities by careful test excavations.

.7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.

.8 Where utility lines or structures exist in area of excavation, obtain direction of Owner's Representative before removing or re-routing.

.9 Record location of maintained, re-routed and abandoned underground lines.

.10 Confirm locations of recent excavations adjacent to area of excavation.

.2 Existing buildings and surface features:

.1 Conduct, with Owner's Representative condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by work.

.2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Owner's Representative.

.3 Where required for excavation, cut roots or branches as approved by Owner's Representative.

PART 2 PRODUCTS

2.1 MATERIALS

.1 .1 Backfill Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	%Passing	
	Type1	Type2
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

.2 Type 3 fill: selected material from excavation or other sources, approved by Owner's Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

PART 3 EXECUTION

3.1 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 PREPARATION/PROTECTION

.1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Owner's Representative's approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage. Protect buried services that are required to remain undisturbed.

3.3 STRIPPING OF TOPSOIL

.1 Commence topsoil stripping of areas as indicated by Owner's Representative after area has been cleared of brush, weeds and grasses and removed from site.

.2 Strip topsoil to depths as indicated by Owner's Representative. Do not mix topsoil with subsoil.

.3 Stockpile in locations as directed by Owner's Representative. Stockpile height not to exceed 2 m.

.4 Dispose of unused topsoil as directed by Owner's Representative.

3.4 STOCKPILING

.1 Stockpile fill materials in areas designated by Owner's Representative. Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Division 01 and Occupational Health and Safety Act for the Province of Newfoundland and Labrador.

.2 Obtain permit from authority having jurisdiction for temporary diversion of water course.

.3 Construct temporary works to depths, heights and locations as indicated or approved by Owner's Representative.

.4 During backfill operation:

.1 Unless otherwise as indicated or as directed by Owner's Representative remove sheeting and shoring from excavations.

.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500 mm above toe of sheeting.

.5 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.6 Upon completion of substructure construction:

.1 Remove cofferdams, shoring and bracing.

.2 Remove excess materials from site and restore water courses as indicated and as directed by Owner's Representative.

3.6 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while work is in progress.

.2 Submit for Owner's Representative's review details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or any portion of work completed or under construction.

.6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.

3.7 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated by Owner's Representative.

.2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation in accordance with Division 02.

.3 Excavation must not interfere with bearing capacity of adjacent foundations.

.4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.5 For trench excavation, unless otherwise authorized by Owner's Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.6 Keep excavated and stockpiled materials a safe distance away from edge of trench as directed by Owner's Representative.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of surplus and unsuitable excavated material off site.

.9 Do not obstruct flow of surface drainage or natural watercourses.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.11 Notify Owner's Representative when bottom of excavation is reached.

.12 Obtain Owner's Representative approval of completed excavation.

.13 Remove unsuitable material from trench bottom to extent and depth as directed by Owner's Representative.

.14 Correct unauthorized over-excavation as follows:

.1 Fill under bearing surfaces and footings with concrete specified for footings.

.2 Fill under other areas with Type 2 fill compacted to not less than 95% of corrected maximum dry density.

.15 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Owner's Representative.

3.8 FILL TYPES AND COMPACTION

.1 Use fill of types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698 corrected maximum dry density.

.1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95%.

.2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 98%.

.3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 100%.

.4 Retaining walls: use Type 2 fill to subgrade level on high side for minimum 500 mm from wall and compact to 95%. For remaining portion, use Type 3 fill compacted to 95%.

.5 To correct over excavation in trenches: use Type 2 fill to underside of sand bedding compacted to 95%.

3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated.

.2 Place bedding and surround material in unfrozen condition.

3.10 BACKFILLING

.1 Vibratory compaction equipment: approved by Owner's Representative.

.2 Do not proceed with backfilling operations until Owner's Representative has inspected and approved installations.

.3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.4 Do not use backfill material which is frozen or contains ice, snow or debris.

.5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.6 Backfill around installations.

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

.3 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 600 mm.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures.

.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure, and approval obtained from Owner's Representative, or

.2 If approved by Owner's Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Owner's Representative.

3.11 RESTORATION

.1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Owner's Representative.

.2 Replace topsoil as indicated by Owner's Representative.

.3 Reinstate lawns to elevation which existed before excavation.

.4 Reinstate pavement and sidewalks distributed by excavation to thickness, structure, and elevation which existed before excavation.

.5 Clean and reinstate areas affected by work as directed by Owner's Representative.

.6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 h.

PART 1 GENERAL

1.1 OBJECTIVES

.1 Prevent the loss of soil from construction site resulting from storm water runoff, wind erosion and construction activities.

.2 Prevent the sedimentation of storm sewers and receiving waters.

.3 Prevent air pollution caused by dust and particulate matter.

.4 Meet or exceed the requirements of LEED® Canada-NC Version 1.0 Sustainable Sites Prerequisite 1 "Erosion and Sedimentation Control" which specifies compliance with EPA832/R-92-005 (September 1992), Storm Water Management for Construction Activities, Chapter 3, or local erosion and sedimentation control standards and codes, whichever is more stringent.

1.2 DESCRIPTION OF WORK

.1 Implement the Erosion and Sedimentation Control (ESC) measures shown on the project drawings and described in these specifications.

.2 Install ESC products in accordance with manufacturer instructions and the prescribed installation procedures in the referenced EPA document.

.3 Inspect ESC measures on a weekly basis and following all significant storm events. If deficiencies are found, make repairs within 24 hours of detection.

.4 Maintain an ESC inspection log to document observations, deficiencies and corrective actions.

1.3 REFERENCES

.1 U.S. Environmental Protection Agency, Office of Water. "Chapter 3: Sediment and Erosion Control" and Chapter 4: Other Controls". Document No. EPA 832-R-92-005 Storm Water Management for Construction Activities.

.2 Canada Green Building Council. "Sustainable Sites Prerequisite 1: Erosion and Sedimentation Control". Leadership in Energy and Environmental Design Reference Package for New Construction and Major Renovations (LEED® Canada-NC) Version 1.0.

1.4 LEED® CONSTRUCTION COORDINATOR

.1 Designate an individual to be responsible for all aspects of LEED® coordination during construction (including erosion and sedimentation control).

.2 The LEED® Construction Coordinator shall be responsible for:

.1 Supervising on-site ESC activities on a daily basis

.2 Conducting ESC inspections

.3 Coordinating ESC tacks with subcontractors to ensure timely and orderly progress of the work

.4 Preparing ESC documentation and submittals

.5 Reporting ESC progress to Owner's Representative

.3 The LEED® Construction Coordinator is to be regularly on-site during construction.

1.5 LEED® KICK-OFF MEETING

.1 Prior to start of construction, the LEED® Construction Coordinator shall hold a kick-of meeting with the Owner's Representative to review the Erosion and Sedimentation Control requirements. This meeting shall include a review of:

.1 Erosion and Sedimentation Control Objectives

.2 Erosion and Sedimentation Control Requirements and Procedures

.3 Erosion and Sedimentation Control Postings and Submittals

1.6 SUBMITTALS

.1 Inspection Checklist – Schedule A

.1 Prepare the checklist to include all measures shown on the drawings and described in the specifications.

.2 Complete a new checklist with each inspection and keep completed checklists with the weekly inspection log documentation.

.2 Weekly Inspection Log – Schedule B

.1 Complete the log on a weekly basis and keep all documentation on-site and available for review by the Owner's Representative.

.2 The inspection log shall be completed for each inspection, and must document deficiencies for all measures indicated as "Not OK" on the inspection ckecklist.

.3 Each deficiency must be initialled and each log signed, only after all corrective measures have been completed and documented.

.4 Submit all ESC documentation (e.g.: inspection checklists and inspection log) to the Owner's Representative after final landscaping is completely installed.

.3 Photographs:

.1 A minimum of three (3) digital photographs shall be taken (from various viewpoints) of each ESC measure implemented on-site immediately following installation.

.2 A minimum of three (3) digital photographs shall be taken (from various viewpoints) of ESC measure implemented on-site at the end of construction or prior to dismantling, whichever comes first.

.3 Submit all digital photographs to Owner's Representative for documentation within seven (7) days of being taken.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

3.1 PROCEDURES

.1 General Practices:

.1 Stabilized Construction Entrance (SCE)

.1 Construct an SCE before construction begins at every point where traffic leaves the site and enters onto a public road and/or any unpaved entrance/exit location where there is a risk of transporting mud or sediment onto paved roads.

.2 The SCE must be at least 3.65 m wide, with room for two vehicles to pass at high traffic areas, and constructed from 50 mm diameter clear stone, 150 mm diamater rip rap, and filter fabric with the following characteristics:

.1	Grab Tensile Strength:	100 kgs
.2	Elongation Failure:	60%
.3	Mullen Burst Strength:	195 kgs
.4	Puncture Strength:	57 kgs
.5	Equivalent Opening:	Size 40-80 (US std sieve)

.2 Site Arrangement

.1 All construction trailers and equipment shall be positioned to reduce the disturbance of site. They shall be located close to the current phase of construction to minimize traffic damage to the site.

.3 Material Stockpiling

.1 If material in stockpile will not be used within 14 days, it must be stabilized using one of the following measures:

.1 Temporary Seeding

.2 Tarps

.3 Compaction

.4 Surface Roughening

.4 Install ESC products in accordance with manufacturer instructions and the prescribed installation procedures in the referenced EPA document.

.2 Stabilization Practices

.1 Preservation of Natural Vegetation

.1 Establish construction boundaries to limit site disturbance to 40 feet beyond the building perimeter, 1.5 m beyond primary roadway curbs, walkways and main utility branches and 7.6 m beyond parking areas.

.2 Stakes shall be used to indicate limits of construction, grading and disturbance. Trees shall be clearly marked to be preserved and protected from the ground disturbances around the base.

.2 Buffer Zones

.1 Incorporate vegetated strips of land on floodplains, next to wetlands, along stream banks and on steep, unstable slopes to decrease the velocity of storm water runoff, preventing soil erosion.

.2 May be an area of vegetation left undisturbed during construction, or it can be newly planted. New strips require establishment of permanent seeding and planting.

.3 Soil Retaining Measures

.1 Use skeleton sheeting, continuous sheeting or permanent retaining walls to hold in place loose or unstable soil where other soil retaining methods are not practical.

.4 Permanent Seeding

.1 Shall be applied to any graded or cleared area as specified on landscaping plan.

.2 Plant native species of grass, trees and shrubs during favourable growth conditions; for areas outside of construction activity preferably within 3 weeks of construction start.

.3 Species shall not require permanent irrigation after the first two years or fertilizers containing phosphorus. Species must not be invasive.

.4 Use topsoil on areas where topsoil has been removed, where soil is dense or impermeable, or where mulching and fertilizers alone cannot improve soil quality. Make topsoil layers at least 150 mm deep or similar to the existing topsoil depth.

.3 Structural Practices

.1 Silt Fence

.1 Construct posts with filter fabric media to remove sediment from storm water volumes flowing through the fence.

.2 The lower edge of the fence is to be vertically trenched and covered by backfill.

.3 Filter fabric should be a pervious sheet of polypropylene, nylon, polyester, polyethylene or equivalent and have the following characteristics:

.1 Filtering Efficiency: 75%-85% (minimum)

.2	Tensile Strength at 20% (max) Elongation	Standard Strength – 0.54 kg/mm Extra Strength – 0.89 kg/mm
.3	Slurry Flow Rate	15.0 L/m2/min (min)

.2 Outlet Protection

.1 Install stone, riprap, concrete aprons, paved sections or settling basins at all pipe, interceptor dike, swale or channel outlets where the velocity of flow may cause erosion or pools at the outlets of an ESC measure.

.3 Inlet Protection

.1 Install stone, concrete masonry units and stone, filter fabric or slit fences around catch basins and manhole covers to prevent silting of inlets, storm drainage systems or receiving channels.

.4 Check Dams

.1 Install check dams in steeply sloped swales or in swales where adequate vegetation cannot be established, and only in small open channels which will not overflow once dams are constructed.

.2 Construct small, temporary or permanent dam of stone, straw bales, logs or pea gravel-filled sandbags across a drainage ditch, swale of channel to slow water flow and allow suspended sediment to settle.

.5 Drainage Swale

.1 Construct a channel with a lining of vegetation, riprap, asphalt, concrete or other material to convey runoff from the bottom or top of a slope.

.2 Intercepted runoff shall be diverted to an appropriate outlet with sediment trap if required; swale shall have a positive grade with no dips to collect water.

.3 Swale shall be lined using geotextiles, grass, sod, riprap, asphalt or concrete – based on the volume and velocity of the runoff.

.6 Gravel or Stone Filter Berm

.1 Construct a temporary ridge of loose gravel, stone or crushed rock to slow filter flow and divert it from exposed traffic in areas with gentle slopes and traffic.

.7 Sediment Trap

.1 Excavate a pond area or construct earthen embankments to allow for settling of sediment from storm water volumes.

.2 Incorporate temporary seeding, mulching and/or earth dike per installation procedures to reduce erosion of banks.

.3 Use a sediment trap for small drainage areas, no more than 2 hectares (5 acres).

.8 Temporary Sediment Basin

.1 Use sediment basins for areas larger than 2 hectares (5 acres).

.2 Construct a pond with a controlled water release structure to allow for settling of sediment from water volumes.

.3 Construction shall occur before any clearing and grading occurs, and must not be built on an embankment in an active stream.

.4 Incorporate temporary seeding, mulching and/or earth dike per installation procedures to reduce erosion of banks.

.5 Outlet pipe and spill way shall be designed by Owner's Representative based on an analysis of the expected runoff flow rates from the site.

.9 Subsurface Drains

.1 Place a perforated pipe or conduit beneath the surface of the ground at a designed depth and grade to drain an area with high water table.

.2 Use relief drains in a gridiron, herringbone or random pattern to dewater an area where the water table is high.

.3 Place interceptor drains, as single pipes, to remove water where sloping soils are excessively wet or subject to slippage.

.4 Backfill with open granular, highly permeable soil immediately after pipe is placed.

.5 Stabilize outlet and ensure sediment-laden storm water runoff is directed to a sediment trapping measure.

3.2 INSPECTIONS AND MAINTENANCE

.1 Inspection procedures specified below summarize the EPA document and shall be followed in conjunction with details, drawings and manufacturer requirements.

.2 Inspect all control measures at least once each week (unless otherwise noted) and following any significant storm (13 mm of precipitation or greater). Complete the inspection log for each inspection, and keep in an accessible location on site until all corrective measures have been documented. Submit each completed log to the Owner's Representative for review.

.3 Maintain all measures in good working order. If a repair is necessary, initiate within 24 hours of report.

.4 Stabilized Construction Entrance: Apply additional gravel as required, remove sediments and other materials from all areas to minimize clogging. Keep adjacent public roadway(s) free from sediment.

.5 Site Arrangement: Verify that movement of construction equipment to appropriate area occurs at the same time as movement of construction activities.

.6 Material Stockpile: Inspect for effective prevention of runoff and erosion. Remove built-up sediment from silt fence when it has reached 1/3 the height of the filter fabric.

.7 Preservation of Natural Vegetation: Routine maintenance shall include mowing, fertilizing, liming, irrigating, pruning and weed and pest control, depending on the

specific species and environmental conditions. Remove any debris and ensure area is protected from traffic.

.8 Buffer Zones: Routine maintenance shall include mowing, fertilizing, liming, irrigating, pruning and weed and pest control, depending on the specific species and environmental conditions. Remove any debris and ensure area is protected from traffic.

.9 Soil Retaining Measures: Inspect for structural damage and repair as required.

.10 Permanent Seeding: Inspect for sufficient growth and water conditions. Replant areas if cover does not provide erosion control.

.11 Silt Fence: Silt fence to be inspected for depth of sediment, tears, loose fabric attachment at fence posts, channel erosion beneath fence, sagging or collapse, and to ensure the fence posts are firmly in the ground. Built-up sediment is to be removed from silt fence when it has reached 1/3 the height of the fence. Repair such that fence is in original installation condition.

.12 Outlet Protection: Inspect for erosion and pooling of water. Necessary repairs to be made as required to reduce exit velocity of runoff. If a riprap apron is used, inspect for riprap displacement and damage to filter fabric.

.13 Inlet Protection: Inspect that measures are in original installed condition. Ensure measures are effectively trapping sediment. Remove accumulated sediment and debris when it reaches ½ the design depth of the trap. Repair protection measures as required.

.14 Check Dams: Inspect for sediment and debris accumulation and erosion of sides. Sediment should be removed when it reaches ½ the original dam height. Repair dam as required.

.15 Drainage Swale: Inspect for dips or low points along the swale where water is pooling and ensure that runoff is being directed to sediment-trapping measure used onsite.

.16 Gravel or Stone Filter Berm: Inspect for breach in structure caused by vehicles, and accumulated sediment. Replace filter material if needed and remove and properly dispose of accumulated sediment.

.17 Temporary Sediment Basin/ Sediment Trap: Remove sediment when it reaches 300 mm in depth. If outlet becomes clogged with sediment it must be cleaned to restore flow capacity. Maintain until site area is permanently stabilized and/or permanent structures are in place. Ensure bank is sufficiently compacted and stabilized such that erosion into basin does not occur.

.18 Subsurface Drains: Inspect pipe for breaks or clogging by sediment or debris. Remove blockage immediately, replace any broken sections and restabilize the surface. Check inlets and outlets for sediment or debris, and remove and dispose of these materials properly.

3.3 REMOVAL OF PRODUCTS

.1 ESC measures shall not be removed and shall be fully inspected and maintained until final landscaping is complete.

Inspection Checklist – Schedule A

Project Name: _____

Completed By: _____

Date: _____

During Construction: LEED® Project Manager to complete this Inspection Checklist ***once a week*** as per the ESC Specification. For each measure, check the "OK" box if there are no repairs or maintenance required; check the "Not OK" box if attention is required as per the inspection/maintenance procedures in the ESC specification.

For all measures marked as "Not OK", the Inspection Log must be completed. List the measures that are deficient in the "Deficiencies" column on the Inspection Log, and record the maintenance performed. Submit both the Inspection Checklist and Inspection Log to the LEED® Owner's Representative after all maintenance activities have been completed and recorded.

OK	Not OK	Location on Site	Measure

Inspection Log – Schedule B

Erosion & Sedimentation Control Weekly Inspection Log

Log Start Date: _____

Log End Date: _____

Log Completed By: _____

Company: _____

Telephone No.: _____

Inspection Date	General Observations (ie: seasonal conditions)	Location & Deficiency of ESC Measure	Corrective Measures	Initials

I hereby certify that the information provided is complete, correct and complies with the requirements of EPA Best Management Practices.

Signature	Title	Date

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 31 05 16 - Aggregate Materials.

.2 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.3 Section 32 11 23 - Aggregate Base Courses.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM).

.1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).

.4 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).

.5 ASTM D4318, Standard Test Methods for Liquid Unit, Plastic Unit and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch series.

.2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Granular sub-base material to Section 31 05 16 - Aggregate Materials and following requirements:

.1 Crushed pit run or screened stone, gravel or sand.

.2 Granulations to be within limits specified when tested to ASTM C136 and ASTM C117 - sieve sizes to CAN/CGSB-8.1.

.1 Granulation to:

Sieve Designation	% Passing (Base Type 2)
100 mm	-
75 mm	-
50 mm	75-100

38.1 mm	-
25 mm	-
19 mm	-
15.9 mm	45-80
12.5 mm	-
9.5 mm	-
4.75 mm	25-55
2.00 mm	-
1.20 mm	12-35
0.425 mm	-
0.180 mm	-
0.075 mm	3-6

.3 Other properties as follows:

.1 Liquid limit: to ASTM D4318, maximum 25

.2 Plasticity index: to ASTM D4318, maximum 6

PART 3 EXECUTION

3.1 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by Owner's Representative.

.2 Construct granular sub-base to depth and grade in areas indicated.

.3 Ensure no frozen material is placed.

.4 Place material only on clean unfrozen surface, free from snow or ice.

.5 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Owner's Representative may authorize thicker lifts (layers) if specified compaction can be achieved.

.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.8 Remove and replace portion of layer in which material has become segregated during spreading.

3.2 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Compact to density of not less than 98% corrected maximum dry density ASTM D698.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.4 Apply water as necessary during compaction to obtain specified density.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Owner's Representative.

.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.4 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Owner's Representative.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 31 05 16 - Aggregate Materials.

.2 Section 32 11 16.01 - Granular Sub Base.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM).

- .1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C136, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM D136, Standard Test Method for Sieve Analysis of Fine and Course Aggregated.
- .4 ASTM D698, Stand Test Methods for Laboratory Compaction Characteristics of Soil Using standard Effort (12,400 ft-lbf/ft^3)(600 N m/m^3).
- .5 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).
- .6 ASTTM D 1883, Standard Test Method of CBR (California Bearing Ratio) of Laboratory Compacted Soil.
- .7 ASTM D4318, Standard Test Methods for Liquid Unit, Plastic Unit and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-8.1, Sieves, Testing, Woven-Wire, Inch Series.
- .2 CAN/CGSB-8.2-, Sieves, Testing, Woven Wire, Metric.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Deliver and stockpile aggregates in accordance with Section 31 05 16 – Aggregate Materials. Stockpile minimum 50% of total aggregate required prior to commencing operation.

.2 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Granular base: material to Section 31 05 16- Aggregate Materials and the following requirements:

.1 Crushed stone or gravel.

.2 Granulations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB - 8.1.

.1 Granulation to:

Sieve Designation	% Passing (Base Type 1)
200 mm	-
75 mm	-
50 mm	-
38.1 mm	-
25 mm	-
19 mm	100
15.9 mm	-
12.5 mm	-
9.5 mm	55-80
4.75 mm	35-60
2.00 mm	-
1.20 mm	17-35
0.425 mm	-
0.180 mm	-
0.075 mm	3-6

.3 .Liquid limit: to ASTM D4318, maximum 25

.4 Plasticity index: to ASTM D4318 maximum 6

.5 Los Angeles degranulation: to ASTM C131. Maximum % loss by weight 45.

.6 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least 1 (one) freshly fractured face. Materials to be divided into ranges using methods of ASTM C136.

Passing		Retained on	
50 mm	to	25	mm
25 mm	to	19	mm
19 mm	to	4.75	mm

.7 Soaked CBR to ASTMD1833, min 100 when compacted to 100% of ASTM D1557.

PART 3 EXECUTION

3.1 SEQUENCE OF OPERATION

.1 Place granular base after granular sub base surface is inspected and approved by Owner's Representative.

.1 Construct granular base to depth and grade in areas indicated.

.2 Ensure no frozen material is placed.

.3 Place material only on clean unfrozen surface, free from snow and ice.

.4 Place material using methods which do not lead to segregation or degradation of aggregate.

.5 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Owner's Representative may authorize thicker lifts (layers) if specified compaction can be achieved.

.6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.7 Remove and replace that portion of layer in which material becomes segregated during spreading.

.2 Compaction Equipment

.1 Compaction equipment to be capable of obtaining required material densities.

.3 Compacting

.1 Compact to density not less than 100% corrected maximum dry density ASTM D698

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Owner's Representative.

.5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.2 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.3 PROTECTION

.1 Maintain finished base in condition conforming to this section until succeeding material is applied or until acceptance by Owner's Representative.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for asphalt concrete pavement for car park areas, driveways to buildings, and walks or play areas.

1.2 RELATED SECTIONS

.1 Section 01 45 00 – Quality Control.

.2 Section 31 05 16 – Aggregate Materials.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-8.1, Sieves Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves Testing, Woven Wire, Metric.
- .3 CAN/CGSB-16.1, Cutback Asphalts for Road Purposes.

.2 American Association of State Highway and Transportation Officials (AASHTO)

- .1 AASHTO M320 - Standard Specification for Performance Grade Asphalt Binder.

.3 American Society for Testing and Materials International, (ASTM)

- .1 ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- .2 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM C123, Standard Test Method for Lightweight Particles in Aggregate.
- .4 ASTM C127, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
- .5 ASTM C128, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
- .6 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .7 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .8 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).

.9 ASTM D977 – Standard Specification for Emulsified Asphalt.

.10 ASTM D995, Standard Specification for Requirements Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

.11 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

.12 ASTM D3203, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

.13 ASTM D4318, Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.14 ASTM D4791, Standard Test Method for Flat Particles or Elongated Particles in Coarse Aggregate.

.4 Asphalt Institute (AI)

.1 Asphalt Institute MS-2-1993 Sixth Edition, Mix Design Methods for Asphalt Concrete.

1.4 SUBMITTALS

.1 Submit asphalt concrete mix design to Owner's Representative for approval.

.2 Materials to be tested by testing laboratory approved by Owner's Representative.

.3 Submit test certificates showing suitability of materials at least 4 weeks prior to commencing work.

.4 Inform Owner's Representative of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing work.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Granular base and sub-base material: to Section 31 05 16 – Aggregate Materials and following requirements:

.1 Crushed or screened stone, gravel or sand.

.2 Gradations: within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

.3 Table:

Sieve Designation	**Granular Base**	**Granular Sub-Base**
200 mm	-	-
75 mm	-	-
50 mm	-	75-100
38.1 m	-	-

Sieve Designation	Granular Base	Granular Sub-Base
25 mm	-	-
19 mm	100	-
15.9 mm	-	45-80
12.5 mm	-	-
9.5 mm	55-80	-
4.75 mm	35-60	25-55
2.00 mm	-	-
1.20 mm	17-35	12-35
0.425 mm	-	-
0.180 mm	-	-
0.075 mm	3-6	3-6

.4 Granular base aggregates:

.1 Crushed particles: at least 50 % of particles by mass retained on 4.75 mm sieve to have at least 1 freshly fractured face.

.2 Asphalt concrete aggregates:

.1 Coarse aggregate is aggregate retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm sieve when tested to ASTM C117.

.2 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from coarse aggregate.

.3 Separate stock piles for coarse and fine aggregate are not required for sheet asphalt.

.4 Do not use aggregates having known polishing characteristics in mixes for surface courses.

.5 Aggregate: material to Section 31 05 16 – Aggregate Materials and following requirements:

.1 Crushed stone or gravel.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117, Latest Edition. Sieve sizes to CAN/CGSB-8.1, Latest Edition.

Sieve Designation (Type 1) Base	% Passing (Base Type 2)
19.0 mm	100
9.5 mm	60-80
4.75 mm	40-65
2.00 mm	30-50
0.180 mm	5-20
0.075 mm	3-8

.3 Sand equivalent: to ASTM D2419, Minimum 50.

.4 Magnesium Sulphate soundness: to ASTM C88. Max % loss by weight: coarse aggregate 12, fine aggregate 16.

.5 Los Angeles Degradation: to ASTM C131, Max % loss by weight: coarse aggregate, 35.

.6 Absorption: to ASTM C127, Max % by weight: coarse aggregate, 1.75.

.7 Lightweight particles: to ASTM C123, Max % by mass, with less than 1.95. Relative density (formally Specific Gravity): 1.5.

.8 Flat and elongated particles: to ASTM D4791, (with length to thickness ratio greater than 5): Max % by weight: coarse aggregate, 15.

.9 Crushed particles: at least 60 % of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face. Material to be divided into ranges using methods of ASTM C136,

Passing		Retained on
19 mm	to	9.5 mm
9.5 mm	to	4.75 mm

.10 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.

.3 Mineral filler for asphalt concrete:

.1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.

.2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed by Owner's Representative to improve mix properties.

.4 Asphalt cement: to AASHTO M320.

.5 Asphalt Prime: to ASTM D997.

.6 Sand blotter: clean granular material passing 4.75 mm sieve and free from organic matter or other deleterious materials.

.7 Asphalt tack coat: to ASTM D977.

2.2 MIX DESIGN

.1 Job mix formula to be approved by Owner's Representative.

.2 Design of mix: by Marshall method to requirements below:

.1 Compaction blows on each face of test specimens: 50.

.2 Mix physical requirements:

Property	Asphalt / Concrete
Marshall Stability at 60°kN minimum	5.5
Flow Value, mm.	2 - 4

Air Voids in Mixture, %	3 - 5
Voids in Mineral Aggregate, % minimum	15
Index of Retained Stability, % minimum	75

.3 Measure physical requirements as follows:

.1 Marshall load and flow value.

.2 Compute void properties on basis of bulk specific gravity of aggregate to ASTM C127, and ASTM C128. Make allowance for volume of asphalt absorbed into pores of aggregate.

.3 Air voids: to ASTM D3203.

.4 Voids in mineral aggregate: to Asphalt Institute, MS-2 chapter 4.

.5 Index of Retained Stability.

.4 Do not change job-mix without prior approval of Owner's Representative. When change in material source proposed, new job-mix formula to be approved by Owner's Representative.

.5 Return plant dust collected during processing to mix in quantities acceptable to Owner's Representative.

2.3 EQUIPMENT

.1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers: sufficient number of rollers of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers for parking lots and driveway:

.1 Minimum drum diameter: 750mm.

.2 Maximum amplitude of vibration (machine setting): 0.5mm for lifts less than 40mm thick.

.4 Haul trucks: of sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:

.1 Boxes with tight metal bottoms.

.2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.

.3 In cool weather or for long hauls, insulate entire contact area of each truck box.

.5 Suitable hand tools

PART 3 EXECUTION

3.1 SUBGRADE SURFACE PREPARATION AND INSPECTION

.1 Verify grades of subgrade drains and other items set in paving area for conformity with elevations and sections before placing granular base material.

.2 Obtain approval of subgrade by Owner's Representative before placing granular base.

3.2 GRANULAR BASE AND GRANULAR SUBBASE

.1 Place granular base and sub-base material on clean unfrozen surface, free from snow and ice.

.2 Place granular base and sub-base to compacted thicknesses as indicated. Do not place frozen material.

.3 Place in layers not exceeding 150 mm compacted thickness. Compact to density not less than 98 % maximum dry density in accordance with ASTM D698.

.4 Finished base surface to be within 10 mm of specified grade, but not uniformly high or low.

3.3 ASPHALT PRIME

.1 Emulsified asphalt:

.1 Dilute asphalt emulsion with clean water at 1:1 ratio for application. Mix thoroughly by pumping or other method approved by Owner's Representative.

.2 Apply diluted asphalt emulsion at rate directed by Owner's Representative but do not exceed 5 L/m^2.

.3 Apply on damp surface unless otherwise directed by Owner's Representative.

.2 Do not apply prime when air temperature is less than 5°C or when rain is forecast within 2 hours.

.3 If asphalt prime fails to set within 24 hours, spread sand blotter material in amounts required to absorb excess material. Sweep and remove excess blotter material.

3.4 PLANT AND MIXING REQUIREMENTS

.1 To ASTM D995.

3.5 ASPHALT CONCRETE PAVING

.1 Obtain approval of primer from Owner's Representative before placing asphalt mix.

.2 Place asphalt mix only when base or previous course is dry and air temperature is above 5°C.

.3 Place asphalt concrete in compacted layers not exceeding 50 mm.

.4 Minimum 135°C mix temperature required when spreading.

.5 Maximum 160°C mix temperature permitted at any time.

.6 Compact each course with roller as soon as it can support roller weight without undue cracking or displacement.

.7 Compact parking lot and driveway asphalt concrete to density not less than 95 % of density obtained with Marshall specimens prepared in accordance with ASTM D1559, ion from samples of mix being used. Roll until roller marks are eliminated.

.8 Keep roller speed slow enough to avoid mix displacement and do not stop roller on fresh pavement.

.9 Moisten roller wheels with water to prevent pick up of material.

.10 Compact mix with hot tampers or other equipment approved by Owner's Representative in areas inaccessible to roller.

.11 Finish surface to be within 10 mm of design elevation and with no irregularities greater than 10 mm in 4.5 m.

.12 Repair areas showing checking, rippling or segregation as directed by Owner's Representative.

3.6 JOINTS

.1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.

.2 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.3 For cold joints, cut back to full depth vertical face and tack face with hot asphalt.

.4 For longitudinal joints, overlap previously laid strip with spreader by 25 to 50 mm.

3.7 TESTING

.1 Inspection and testing of asphalt pavement will be carried out by designated testing laboratory. Refer to 01 45 00 - Quality Control.

.2 Costs of tests will be paid under Section 01 21 00 – Allowances.

3.8 PROTECTION

.1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38°C. Do not permit stationary loads on pavement until 24 hours after placement.

.2 Provide access to buildings as required. Arrange paving schedule so as not to interfere with normal use of premises.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for sand-set unit paving without mortared joints for pedestrian or light vehicular traffic.

1.2 RELATED SECTIONS

.1 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.2 Section 32 11 23 – Aggregate Base Courses.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM)

- .1 ASTM C117, Standard Test Method for Material Finer Than 0.075 (No.200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM E11, Standard Specification for Wire-Cloth Sieves for Testing Purposes.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA)

- .1 CSA A23.1/A23.2, Concrete Materials and Methods of Construction/Methods of Test for Concrete.
- .2 CSA A179, Mortar and Grout for Unit Masonry.
- .3 CSA-A231.1, Precast Concrete Paving Slabs.

1.4 SUBMITTALS

.1 Submit following product test data:

- .1 Sieve analysis for granulation of bedding and joint material.
- .2 Unit paver test data.

.2 Submit full size samples of each type of paving unit.

.3 Indicate layout, pattern and relationship of paving joints to fixtures and project formed details.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Interlocking Concrete Pavers: uniform in material, colour, size and from one manufacturer.

.2 Pavers to be manufactured in accordance to CSA A231.2-M85, precast pavers. Pattern - as indicated on drawings. Compressive Strength, 50-60 MPa after 28 days, maximum water absorption – 5%, maximum weight loss 0.35% after 50 freeze-thaw cycles, where totally immersed in 3% sodium chloride solution. Abrasion hardness to ASTM C241-51, Color as selected by Owner's Representative.

.3 Granular base to Section 32 11 23 – Aggregate Base Courses.

.4 Manufactured sand for bedding: hard, durable, crushed stone particles, conforming to the gradation of concrete sand as specified in CAN/CSA A23.1. Sand shall be free from clay lumps, cementation, organic material, frozen material and other deleterious materials. Do not use limestone screenings or stone dust.

.1 Gradations: with units specified when tested to ASTM C136, and ASTM C117. Sieve sizes to CAN/CGSB-8.1 rather than ASTM E11.0% shall pass the 0.075 mm sieve.

Sieve Designation	% Passing
10 mm	100
5 mm	95-100
2.5 mm	80-100
1.25 mm	50- 90
0.630 mm	25- 60
0.315 mm	10- 35
0.160 mm	2- 10

.5 Joint sand: to CSA A179, hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

.6 Edging Restraint: 30 MPa floating concrete curb, 150mm high, 150mm wide as detailed.

PART 3 EXECUTION

3.1 PROTECTION

.1 Prevent damage to buildings, landscaping, curbs, sidewalks, trees, fences, roads and adjacent property. Make good any damage.

.2 Provide access to building at all times. Coordinate paving schedule to minimize interference with normal use of premises.

3.2 SUBGRADE

.1 Ensure that subgrade preparation conforms to levels and compaction required to allow for installation of granular base, and has been inspected and approved by Owner's Representative.

3.3 BASE PREPARATION

.1 Granular Base minimum thickness: 150 mm as indicated.

.2 Spread and compact crushed stone or gravel base in uniform layers not exceeding 100 mm compacted thickness.

.3 Compact base to a density of not less than 98 % corrected maximum dry density.

.4 Shape and roll alternately to obtain smooth, even and uniformly compacted granular base and ensure conformity of grades with finish surface.

.5 Apply water as necessary during compaction to obtain specified density. If granular base is excessively moist, remove it and install more granular material to rid it of sponginess.

.6 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.

.7 Ensure top of granular base does not exceed plus or minus 10 mm of finished grade less combined thickness of bedding sand plus surface course.

3.4 EDGING

.1 Install edging true to grade, in location, layout and pattern as indicated.

3.5 GRANULAR LAYING COURSE

.1 Place and spread bedding sand to 50 mm compacted thickness.

3.6 BEDDING SAND

.1 Place and spread bedding sand to thickness as indicated.

.2 Maximum thickness after compaction: 25mm.

.3 Use material other than bedding sand to compensate for depressions that exceed specified tolerances in surface of base.

.4 Do not use joint sand for bedding sand.

3.7 SURFACE COURSE

.1 Ensure bedding sand and granular base are not saturated prior to placement of unit pavers.

.2 Install unit paving true to grade on the bedding sand, in location, layout and pattern as indicated.

.3 Where required, cut units accurately without damaging edges.

.4 Install unit pavers with joints not exceeding 3 mm.

.5 Compact and level pavers with minimum 22 kN force mechanical plate vibrator on minimum 19 mm thick plywood until units are true to grade and free of movement.

.6 Do not compact unit paving within 1 m of unrestrained edges.

.7 Fill spaces between pavers by sweeping in sand. Complete fill joints by watering down paving surfaces. Add sand during watering down, until joints filled.

.8 Pass mechanical plate on sand cushion over surface course to achieve compaction of sand in joints. Ensure joints are full at completion of compaction.

.9 At completion of each work day, ensure work within 1 m of laying face is left fully compacted with sand filled joints.

.10 Surface of finished pavement: free from depressions exceeding 3 mm as measured with 3 m straight edge.

.11 Sweep surface clean and check final elevations for conformance to drawings

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 78 00 - Closeout Submittals.

.2 Section 22 11 18 - Domestic Water Piping Copper.

.3 Section 33 11 16 - Site Water Utility Distribution Piping

1.2 REFERENCES

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)

.1 ANSI/AWWA C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

.2 ANSI/AWWA C110/A21.10, Ductile Iron and Gray Iron Fittings, 3 inch through 48 inch for Water and Other Liquids.

.3 ANSI/AWWA C111/A21.11, Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

.4 ANSI/AWWA C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast, for Water.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.3 Manufacturer's Standardization Society of the Valve and Fittings Industry

.1 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Division 01.

.2 Submit data for following: valves, couplings, mechanical joints.

1.4 CLOSEOUT SUBMITTALS

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

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction /Demolition Waste Management and Disposal.

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

.3 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.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Owner's Representative.

PART 2 PRODUCTS

2.1 PIPE

.1 Service water pipe: ductile iron cement mortar lined from 1 m outside of building or as indicated to:

.1 Ductile iron: ANSI/AWWA C151/A21.51.

.2 Cement mortar lining for ductile iron pipe: to ANSI/AWWA C104/A21.4.

2.2 FITTINGS

.1 NPS 3 and larger mechanical joints or flanged: to ANSI/AWWA C110/A21.10.

2.3 JOINTS

.1 Rubber gaskets for mechanical joints or flanges: to ANSI/AWWA C111/A21.11.

.2 Bolts, nuts, hex head with washers: to ASTM A307, heavy series.

2.4 GATE VALVES

.1 Rising stem: to MSS SP-70, class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code and local authority having jurisdiction.

.2 Piping cut square, reamed, free of cuttings and foreign material.

.3 Minimum depth of bury: 1500 mm.

.4 Lay buried piping in compacted washed sand in accordance with AWWA Class "B" bedding. Where existing ground below bedding is unstable, install pipe on continuous concrete support.

.5 Where piping enters building, provide support, and seal with modular link type seal with sleeve against ingress of moisture; to approval of authority having jurisdiction.

.6 Assemble piping using fittings manufactured to ANSI standards and in accordance with manufacturer's instructions.

.7 Apply one layer of protective coating to buried piping.

3.2 PRESSURE TESTING

.1 Conform to Mechanical Division.

.2 Submit reports for inclusion into Commissioning Manuals.

3.3 DISINFECTION

.1 Coordinate with Section 33 11 16 – Site Water Utility Distribution Piping and Section 22 11 18- Domestic Water Piping Copper.

.2 Submit bacteriological reports for inclusion into Commissioning Manuals.

END OF SECTION

8GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for water mains, hydrants, valves, valve boxes, and valve chambers, including service connections.

1.2 RELATED SECTIONS

.1 Section 01 78 00 - Closeout Submittals.

.2 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.3 REFERENCES

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)

.1 ANSI/AWWA B301, Liquid Chlorine.

.2 ANSI/AWWA C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

.3 ANSI/AWWA C110/A21.10, Ductile-Iron and Gray Iron Fittings, 3 inch through 48 inch (75 mm through 1200 mm), for Water.

.4 ANSI/AWWA C111/A21.11, Rubber-Gasket Joints for Ductile-Iron and Gray Iron Pressure Pipe and Fittings.

.5 ANSI/AWWA C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast, for Water.

.6 ANSI/AWWA C153/A21.53, Ductile-Iron Compact Fittings for Water Service.

.7 ANSI/AWWA C500, Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).

.8 ANSI/AWWA C600, Installation of Ductile-Iron Water Mains, and Their Appurtenances.

.9 ANSI/AWWA C651, Disinfecting Water Mains.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

.2 ASTM C117, Standard Test Method for Material Finer Than 75 [MU] m (No. 200) Sieve in Mineral Aggregates by Washing.

.3 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM C478M, Standard Specification for Precast Reinforced Concrete Manhole Sections, Metric.

.5 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft (600 kN-m/m^3)).

.3 American Water Works Association (AWWA)/Manual of Practice

.1 AWWA M17, Installation, Field Testing, and Maintenance of Fire Hydrants.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.

.5 Canadian Standards Association (CSA International)

.1 CAN/CSA-A257 Series, Standards for Concrete Pipe.
.2 CSA A3000, Cementitious Materials Compendium
.3 CSA B137 Series, Thermoplastic Pressure Piping Compendium
.4 CAN/CSA-G30.18, Billet Steel Bars for Concrete Reinforcement.
.5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.4 SUBMITTALS

.1 Submit complete shop drawings and construction schedule for water mains 600 mm diameter and larger. Include method for installation of water main.

.2 Inform Owner's Representative of proposed source of bedding materials and provide access for sampling at least 4 weeks prior to commencing work.

.3 Submit manufacturer's test data and certification that pipe materials meet requirements of this section at least 4 weeks prior to beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.

.4 Pipe certification to be on pipe.

1.5 CLOSEOUT SUBMITTALS

.1 Provide record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details, maintenance and operating instructions.

.1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, valve chambers and hydrants.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

1.7 SCHEDULING OF WORK

.1 Schedule Work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions to Owner's Representative for approval and adhere to interruption schedule as approved by Owner's Representative.

.3 Notify Owner's Representative, building occupants, superintendent minimum of two (2) working days in advance of interruption in service.

.4 Notify fire department of any planned or accidental interruption of water supply to hydrants.

.5 Advise local police department of anticipated interference with movement of traffic.

.6 Provide "Out of Service" sign on hydrant not in use.

PART 2 PRODUCTS

2.1 PIPE, JOINTS AND FITTINGS

.1 Ductile iron pipe: to ANSI/AWWA C151/A21.51, pressure class 52, cement mortar lined to ANSI/AWWA C104/A21.4,

.2 Joints and fittings for ductile iron pipe.

- .1 Joints:
  - .1 Rubber gasket for mechanical pipe joints: to ANSI/AWWA C111/A21.11,
  - .2 Bolts, nuts, hex head with washers: to ASTM A307, heavy series.
  - .3 Ensure electrical conductivity across joints.
- .2 Fittings:
  - .1 Mechanical joint cast iron and ductile iron fittings NPS 3 and larger: to ANSI/AWWA C110/A21.10,
  - .2 Compact Fittings to ANSI/AWWA C153/A21.53,
- .3 Reinforced concrete pipe: to CAN/CSA A257.
  - .1 Pipe joints: push-on joints with performance requirements to ANSI/AWWA C111/A21.11,

2.2 VALVES AND VALVE BOXES

.1 Gate valves: to AWWA C500, Latest Edition, standard iron body, bronze mounted double disc valves with non-rising stems. Suitable for 1 Pa with mechanical joints.

.2 Valves to open counter clockwise and to be supplied with a square-sided operating nut, 51 mm to the side unless otherwise specified.

.3 Cast iron valve boxes: bituminous coated screw type adjustable over minimum of 450 mm complete with valve operating extension rod, 30 mm minimum diameter, 25 x 25

mm cross section, of such length that when set on valve operating nut, top of rod will not be more than 150 mm below cover. Top of box to be marked "WATER".

2.3 VALVE CHAMBERS

.1 Concrete and reinforcing steel.

.2 Precast concrete sections to ASTM C478M, Cast ladder rungs integral with unit; field installation not permitted.

.3 Jointing materials:

.1 Manufacturer's rubber ring gaskets.

.2 Mastic joint filler.

.3 Combination of above types.

.4 Ladder rungs for valve chambers: 20 mm diameter deformed rail steel bars to CAN/CSA-G30.18, hot-dipped galvanized after fabrication to CAN/CSA-G164. Rungs to be safety pattern.

2.4 PIPE BEDDING AND SURROUND MATERIAL

.1 Granular material to: Section 31 05 16 - Aggregate Materials and following requirements:

.1 Crushed or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C136, and ASTM C117, Sieve sizes to CAN/CGSB-8.1,

.3 Table:

Sieve Designation	**% Passing**	
	Stone/Gravel	**Gravel/Sand**
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	100	-
19 mm	-	-
12.5 mm	65-90	100
9.5 mm	-	-
4.75 mm	35-55	80-100
2.00 mm	-	50- 90
0.425 mm	10-25	10- 50
0.180 mm	-	-
0.075 mm	0- 8	0- 10

.2 Concrete mixes and materials required for bedding cradles, encasement, supports, thrust blocks: to Section 03 30 00 - Cast-in-Place Concrete. Minimum 28 day strength 25 Mpa.

2.5 BACKFILL MATERIAL

.1 Type 3, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

2.6 PIPE DISINFECTION

.1 Liquid chlorine to ANSI/AWWA B301, to disinfect water mains.

.2 Undertake disinfection of water mains in accordance with ANSI/AWWA C651,

2.7 TOOLS AND EQUIPMENT

.1 Provide Owner's Representative with following tools:

.1 One tee-handle operating keys for valves.

PART 3 EXECUTION

3.1 PREPARATION

.1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation. Carefully inspect materials for defects to approval of Owner's Representative. Remove defective materials from site as directed by Owner's Representative.

3.2 TRENCHING

.1 Do trenching work in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.

.2 Trench depth to provide cover over pipe of not less than 3.05 m from finished grade or as indicated.

.3 Trench alignment and depth require Owner's Representative approval prior to placing bedding material and pipe.

3.3 CONCRETE BEDDING AND ENCASEMENT

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete. Place concrete to details as indicated as directed by Owner's Representative.

.2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.3 Do not backfill over concrete within 24 hours after placing.

3.4 GRANULAR BEDDING

.1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth of 150 mm below bottom of pipe.

.2 Do not place material in frozen condition.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to at least 95% of corrected maximum density to ASTM D698.

.6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling with ***(compacted bedding material, compacted Type 3, fill lean mix concrete)***.

3.5 PIPE INSTALLATION

.1 Terminate building water service 1.5 m inside building wall opposite point of connection to main. Install flange adapter and or coupling necessary for connection to building plumbing. If plumbing is already installed, make connection; otherwise cap or seal end of pipe and place temporary marker to locate pipe end.

.2 Lay pipes to manufacturer's standard instructions and specifications. Do not use blocks except as permitted in 3.3.2.

.3 Join pipes in accordance with manufacturer's recommendations.

.4 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.

.5 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Take up and replace defective pipe. Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.

.6 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.

.7 Keep jointing materials and installed pipe free of dirt and water and other foreign materials. Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 Position and join pipes with equipment and methods approved by Owner's Representative.

.9 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.10 Align pipes before jointing.

.11 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.12 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed or contaminated shall be removed, cleaned, lubricated and replaced before jointing is attempted again.

.13 Complete each joint before laying next length of pipe.

.14 Minimize deflection after joint has been made.

.15 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.16 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Owner's Representative.

.17 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.

.18 Do not lay pipe on frozen bedding.

.19 Do hydrostatic and leakage test and have results approved by Owner's Representative before surrounding and covering joints and fittings with granular material.

.20 Backfill remainder of trench.

3.6 VALVE CHAMBERS

.1 Use cast-in-place, precast units as approved by Owner's Representative.

.2 Construction units as indicated, plumb and centered over valve nut, true to alignment and grade, and not resting on pipe.

.3 Place reinforcing steel and miscellaneous metals required to be embedded in concrete to details indicated and in accordance with Section 03 30 00 – Cast-in-Place Concrete.

.4 Set bottom section of precast unit in bed of cement mortar and bond to bottom slab.

.1 Make each successive joint watertight with approved rubber ring gaskets, mastic joint filler, cement mortar or combination thereof.

.5 Clean surplus mortar and joint compounds from interior surface of valve chambers as work progresses.

.6 Plug lifting holes with mastic compound.

.7 Place frame and cover on top section to elevation indicated. If adjustment is required use concrete ring.

.8 Clean valve chamber of debris and foreign materials, remove fins and sharp projections.

3.7 VALVE INSTALLATION

.1 Install valves to manufacturer's recommendations at locations as indicated.

.2 Support valves located in valve boxes or valve chambers by means of concrete blocks, located between valve and solid ground. Valves not to be supported by pipe.

3.8 HYDRANTS

.1 Install hydrants at locations as indicated.

.2 Install hydrants in accordance with AWWA M17.

.3 Install gate valve and cast iron valve box on hydrant services leads as indicated.

.4 Set hydrants plumb, with hose outlets paralled with edge of pavement or curb line, with pumper connection facing roadway and with body flange set at elevation of 50mm above final grade.

.5 Place concrete thrust blocks as indicated and specified, ensuring that drain holes are unobstructed.

.6 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.

3.9 THRUST BLOCKS AND RESTRAINED JOINTS

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated or as directed by Owner's Representative.

.3 Keep joints and couplings free of concrete.

.4 Do not backfill over concrete within 24 hours after placing.

.5 For restrained joints: only use restrained joints approved by Owner's Representative.

3.10 HYDROSTATIC AND LEAKAGE TESTING

.1 Do tests in accordance with ANSI/AWWA C600.

.2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.

.3 Notify Owner's Representative at least two (2) working days in advance of proposed tests. Perform tests in presence of Owner's Representative.

.4 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.

.5 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Owner's Representative.

.6 Upon completion of pipe laying and after Owner's Representative has inspected work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated.

.7 Leave valves, joints and fittings exposed.

.8 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.

.9 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.

.10 Open valves.

.11 Expel air from main by slowly filling main with potable water. Install corporation stops at high points in main where no air-vacuum release valves are installed. Remove stops after satisfactory completion of test and seal holes with plugs.

.12 Thoroughly examine exposed parts and correct for leakage as necessary.

.13 Apply hydrostatic test pressure of 1000 kPa based on elevation of lowest point in main and corrected to elevation of test gauge, for period of 1 hour.

.14 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.

.15 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.

.16 Repeat hydrostatic test until defects have been corrected.

.17 Define leakage as amount of water supplied from water storage tank in order to maintain test pressure for 2 h.

.18 Do not exceed allowable leakage of 0.03 L/mm diameter per 300 m of pipe, including lateral connections, per hour.

.19 Locate and repair defects if leakage is greater than amount specified.

.20 Repeat test until leakage is within specified allowance for full length of watermain.

.21 Co-ordinate test procedure with Owner's Representative and provide certification of test acceptance.

3.11 PIPE SURROUND

.1 Upon completion of pipe laying and after Owner's Representative has inspected work in place, surround and cover pipes as indicated.

.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Do not dump material within 1.00 m of pipe.

.3 Place layers uniformly and simultaneously on each side of pipe.

.4 Do not place material in frozen condition.

.5 Compact each layer from pipe invert to mid height of pipe to at least 95% maximum density to ASTM D698.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 90 % of corrected maximum density to ASTM D698.

3.12 BACKFILL

.1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.2 Do not place backfill in frozen condition.

.3 Under footings, parking area and walks, compact backfill to at least 95% maximum density to ASTM D698.

3.13 HYDRANT FLOW TESTS

.1 Conduct flow tests on every hydrant to determine fire flows prior to painting hydrant caps and ports.

3.14 PAINTING OF HYDRANTS

.1 After hydrant flow tests, paint caps and ports to meet colour selections approved by authority having jurisdiction.

3.15 FLUSHING AND DISINFECTING

.1 Flushing and disinfecting operations shall be carried out by specialist contractor and witnessed by Owner's Representative. Notify Owner's Representative at least 4 days in advance of proposed date when disinfecting operations will commence.

.2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed and water is clear.

.3 Flushing flows as follows: 38 L/s minimum.

.4 Provide connections and pumps for flushing as required.

.5 Open and close valves, hydrants and service connections to ensure thorough flushing.

.6 When flushing has been completed to satisfaction of Owner's Representative introduce a strong solution of chlorine as approved by Owner's Representative into watermain and ensure that it is distributed throughout entire system.

.7 Disinfect water mains.

.8 Rate of chlorine application to be proportional to rate of water entering pipe.

.9 Chlorine application to be close to point of filling water main and to occur at same time.

.10 Operate valves, hydrants and appurtenances while main contains chlorine solution.

.11 Flush line to remove chlorine solution after 24 hours.

.12 Measure chlorine residuals at extreme end of pipe-line being tested.

.13 Perform bacteriological tests on water main, after chlorine solution has been flushed out. Take samples daily for minimum of two days. Should contamination remain or recur during this period, repeat disinfecting procedure. Specialist contractor to submit certified copy of test results.

.14 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.

.15 Co-ordinate flushing disinfection with Owner's Representative.

.16 Provide certification of test acceptance.

3.16 SURFACE RESTORATION

.1 After installing and backfilling over water mains, restore surface to original condition as directed by Owner's Representative.

3.17 QUALITY ASSURANCE

.1 Provide copies of all inspections and test results for Commissioning Manuals.

END OF SECTION