ABSORPTION CHILLER DECOMMISSIONING
777 MEMORIAL AVENUE, ORILLIA, ONTARIO

MECHANICAL & ELECTRICAL SPECIFICATIONS

ISSUED FOR TENDER SUBMISSION
APRIL 11, 2025

PREPARED BY: MAT 4SITE ENGINEERS LTD.
M4SE #: 24279

SEALS PAGE

DISCIPLINE	SEAL & SIGNATURE
MECHANICAL This seal governs all Documents and Sections of these Specification.	
ELECTRICAL This seal governs all Documents and Sections of these Specification.	

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1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Title and description of Work.

1.1.2 Contractor use of premises.

1.1.3 Owner occupancy.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

1.2.1 The Work of this Contract comprises general construction renovation of Absorption Chiller Decommissioning, located at 777 Memorial Avenue, Orillia, Ontario; and further identified as OPP General Headquarters.

1.2.2 The Work of this Contract includes furnishing all labour, materials, equipment, services and other related expenses to execute the construction of the Work.

1.2.3 This shall be a single phase project.

1.2.4 The Contractor shall be responsible for, and coordinate the work of, all sub-trades.

1.2.5 The Work shall include all information provided via drawings, specifications and supplementary documents.

1.2.6 The following is a General Description of the Work to be performed:

.1 Isolate and cap existing chilled water and heating water lines. Contractor to demolish all piping connected to the absorption chiller and cooling towers, including all valves and accessories (Refer to drawings).

.2 Demolish and remove existing absorption chiller, pumps, and cooling towers from site (Refer to drawings).

1.2.7 The contractor shall obtain and pay for all required regulatory approvals, permits and fees.

1.2.8 Contractor to retain the following base building contractors. Contractor to ensure pricing is obtained and scope is clarified with all base building contractors prior to tender submission.

.1 Buildings Automation Systems – BGIS ITS

.2 Roofing – Provincial Industrial Roofing and Sheet Metal Company Limited.

.1 Dave Lenathen, Office: (905) 669-2569, Cell: (437) 388-3494, Email: dlenathen@provincialroofing.com

1.3 CONTRACTOR USE OF PREMISES

1.3.1 Contractor has restricted use of site.

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

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

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

1.3.5 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

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

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

1.5 RELATED WORK

1.5.1 .1 The following specification sections are referenced to indicate work responsibilities as specified and carried in other versions.

.1 Section 21 05 00 – Common Work Results for Mechanical.

.2 Section 26 05 00 – Common Work Results – Electrical.

1.6 ON-SITE DOCUMENTS

1.6.1 Maintain at job site documents as indicated in Section 01 31 00 – Project Management and Coordination.

1.7 CONTRACT DOCUMENTS

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

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Connecting to existing services.

1.1.2 Special scheduling requirements.

1.2 RELATED SECTIONS

1.2.1 Section 01 32 00 – Construct Progress Documentation.

1.2.2 Section 01 31 00 – Project Management and Coordination

1.3 EXSITING FACILITIES

1.3.1 Comply with Owner's specific facility access requirements and work restrictions.

1.3.2 Coordinate facility access with Owner's Representative.

1.4 EXISTING SERVICES

1.4.1 Include potential interruption of services, hot work permits, and fire alarm bypasses in Project Schedule in accordance with Section 01 31 00 – Project Management and Coordination.

1.4.2 Notify Owner's Representative and utility companies of intended interruption of services and obtain required permission.

1.4.3 Where Work involves breaking into or connecting to existing services, give Owner's Representative a minimum notice of fourteen (14) days for necessary interruption of mechanical or electrical service throughout course of work. (Minimum threshold to be confirmed at construction start-up meeting). Obtain written approval prior to connecting to any existing services. Prepare clearly written sequence and method of work procedures for approval by Owner's Representative. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

1.4.4 Provide for pedestrian and vehicular traffic.

1.4.5 Apply for and obtain "Hot Work" permits from Owner's Representative for any work involving the use or creation of flame and smoke. These permits must be in place prior to the start of any such work.

1.4.6 Coordinate with Owner's Representative for fire alarm shut-down for any work involving the use or creation of flame and smoke.

1.4.7 Coordinate with Owner's Representative for fire protection system shut-down.

1.4.8 Provide fire watch during the course of the work while the fire alarm is by-passed and/or during any fire protection system shut-down.

1.5 USE OF SITE AND FACILITIES

1.5.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative and/or Consultant to facilitate work as stated.

1.5.2 Maintain existing services to building and provide for personnel and vehicle access.

1.5.3 Where security is reduced by work, provide temporary means to maintain security.

1.5.4 Protect walls of passenger elevators, to approval of Consultant prior to use.

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

1.5.6 Closures: protect work temporarily until permanent enclosures are completed.

1.5.7 Work Restrictions

.1 All construction outside of the mechanical rooms to be completed during unoccupied periods.

.2 Construction within the mechanical rooms can be completed during occupied periods taken into account that there is no interference to the building systems and work being undertaken does not impact facility services, i.e. absolutely no work resulting in transmitted noise or vibrations during regular business hours.

.3 X-ray and core drilling can only be completed while buildings are unoccupied.

1.6 SPECIAL REQUIREMENTS

1.6.1 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic, smoking and security regulations.

1.6.2 Keep within limits of work and avenues of ingress and egress.

1.6.3 Ingress and egress of Contractor vehicles at site is limited to the parking lot.

1.7 NOISY, PAINTING, GLUING, SUSTANCES WITH VOC'S AND / OR STRONG ODORS AND TARING (SEALANTS, ROOFING, ETC.)

1.7.1 All noisy work is to be performed after normal business hours inclusive of compressors, drywall screw guns, hammer drilling, core drilling etc. Painting, gluing, working with substances that contain volatile organic compounds (VOC's) and /or have strong odors and tarring work (sealants, roofing, etc.) are to be performed after normal business hours. If building occupants are disturbed, construction will be stopped, with the work / activity to resume after normal business hours (e.g. Pulling BX across a ceiling and hearing the scraping sound or any smell).

1.8 OCCUPATIONAL HEALTH AND SAFETY ACT

1.8.1 As per the Occupational Health and Safety Act, as amended, minimum requirements, anyone within construction area must wear Personal Protective Equipment (PPE), including a hard hat, safety boots, safety glasses and high visibility vest. Failure to do so will result in immediate dismissal from site (without exceptions).

1.8.2 Workplace Hazardous Materials Information System (WHMIS) compliant Material Safety Data Sheets (MSDS) are to be provided by all Sub-contractors identifying when, who, under what condition and in what quantity that they will use the product. The Owner's Project Manager will forward MSDS to Building Management.

1.8.3 Under the Occupational Health and Safety Act, as amended, the Proponent shall undertake the role of the "Constructor" as defined in the act. The Proponent shall be responsible to provide a full safety program for anyone who gets paid for services on the Site including management, labour, delivery drivers, service personnel and others involved for services on the Site. The Proponent will arrange for a pre-project meeting related to safety, joint safety inspections with the Owner where required, Site safety training and safety committees complete with accident investigation procedures.

1.9 SITE PROTECTION

1.9.1 Dust barriers must be used at all times during dusty work. Poly Sheet Dust Barriers are to be sealed tight to floor and ceiling and / or to the filter mediums on return air grilles, etc.

1.9.2 Clean up after all work must be performed immediately and the area(s) are to be left in a clean and safe manner. Failure to clean properly may result in the Proponent being charged for cleaning services obtained by the Building Management and the Building Management may terminate the Proponents access.

1.9.3 Contractor shall protect all existing furniture and equipment such as lighting fixtures, grilles/diffusers, finishes during construction. Vacuum and clean all surfaces once construction activities are complete in each work area.

1.10 ADVANCE NOTIFICATION

1.10.1 Provide minimum five (5) business days advance notification is required for any work affecting the building occupants such as the following:

.1 Mold remediation (removal) work / asbestos abatement (removal) work

.2 X-raying and core drilling

.3 Notification of start time for painting and carpet laying

.4 Notification of exterior work

.5 Notification of any noisy work that has to be done during the normal business hours of the occupants of the building / work site

.6 Notification of any building system shutdown (i.e. power, water etc.)

.7 Notification of any loss of use area (i.e. washroom shutdown, lunchroom etc.)

.8 Excavation

.9 Any work requiring road/sidewalk closures

1.11 BREAKER PANELS

1.11.1 Electrical panels must not be touched without first informing and obtaining written permission from the Owner and the Building Management.

1.11.2 Whenever electrical power is shut off the Proponent must "Lock Out" and "Tag Out" any electrical panels or electrical breakers affected.

1.12 CONTRACTOR FIRE ALARM BYPASS AND FIRE WATCH PROTOCOL

1.12.1 Seven (7) calendar day advance notification is required when requesting the Fire Alarms be bypassed. This request must be made in writing to the Owner and the Building Management.

1.12.2 Provide fire watch of all affected zones at all time fire protection systems are offline and/or bypassed. Contractor shall include for all costs associated with 24/7 fire watch.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Coordination work with other contractors and subcontractors under administration of Owner's Representative.

1.1.2 Scheduled project meetings.

1.2 RELATED SECTIONS

1.2.1 Section 01 11 00 - Summary of Work.

1.2.2 Section 01 14 00 – Work Restrictions.

1.3 DESCRIPTION

1.3.1 Coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities, and construction Work, with progress of Work of other contractors and subcontractors under instructions of Owner's Representative.

1.4 PROJECT MEETINGS

1.4.1 Project meetings to be held at times and locations as determined by Owner's Representative.

1.4.2 Owner's Representative will arrange project meetings and record and distribute minutes.

1.5 CONSTRUCTION ORGANIZATION AND START-UP

1.5.1 Within ten (10) working days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

1.5.2 Establish time and location of meetings and notify parties concerned minimum 5 days before meeting.

1.5.3 Agenda to include following:

.1 Appointment of official representative of participants in Work.

.2 Schedule of Work, progress scheduling in accordance with Section 01 32 00 - Construction Progress Documentation.

.3 Schedule of submission of shop drawings, samples, colour chips in accordance with Section 01 33 00 - Submittal Procedures.

.4 Work restrictions and potential service interruptions in accordance with Section 01 14 00 – Work Restrictions.

.5 Delivery schedule of specified equipment in accordance with Section 01 32 00 - Construction Progress Documentation.

.6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.

.7 Record drawings in accordance with Section 01 78 00 - Closeout Submittals.

.8 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

.9 Take-over procedures, acceptance, and warranties in accordance with Section 01 77 00 - Closeout Procedures and 01 78 00 - Closeout Submittals.

.10 Monthly progress claims, administrative procedures, photographs, and holdbacks.

.11 Appointment of inspection and testing agencies or firms in accordance with Section 01 45 00 - Quality Control.

.12 Insurances and transcript of policies.

1.5.4 Comply with Owner’s Representative's allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.

1.5.5 During construction coordinate use of site and facilities through Owner’s Representative's procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.

1.5.6 Comply with instructions of Owner’s Representative for use of temporary utilities and construction facilities.

1.6 ON-SITE DOCUMENTS

1.6.1 Maintain at job site, one copy each of the following:

.1 Contract drawings.

.2 Specifications.

.3 Addenda.

.4 Reviewed shop drawings.

.5 List of outstanding shop drawings.

.6 Change orders.

.7 Other modifications to Contract.

.8 Field test reports.

.9 Copy of approved Work schedule.

.10 Health and Safety Plan and other Safety related documents.

.11 Manufacturers' installation and application instructions.

.12 Labour conditions and wage schedules.

.13 Other documents as specified.

1.7 SCHEDULES

1.7.1 Submit preliminary construction progress schedule in accordance with Section 01 32 00 - Construction Progress Documents to Owner's Representative coordinated with Owner's Representative's project schedule. Schedule to show anticipated progress stages and final completion of work within time period required by contract documents.

1.7.2 Clearly identify all potential service interruptions on the Project Schedule in accordance with Section 01 14 00 – Work Restrictions.

1.7.3 After review, revise and resubmit schedule to comply with project schedule requirements.

1.7.4 During progress of Work revise and resubmit at project progress meetings or as directed by Owner's Representative.

1.8 SUBMITTALS

1.8.1 Make submittal to Owner's Representative for review.

1.8.2 Submit preliminary shop drawings, product data and samples in accordance with Section 01 33 00 – Submittal Procedures for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to Owner's Representative.

1.8.3 Submit requests for payment for review to Owner's Representative.

1.8.4 Submit requests for interpretation of Contract Documents and obtain instructions through Owner's Representative.

1.8.5 Process change orders through Owner's Representative.

1.8.6 Deliver closeout submittals for review by Owner's Representative.

1.9 COORDINATION

1.9.1 Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.

1.9.2 Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection and operation.

1.9.3 Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

1.9.4 Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair of all components, mechanical, electrical, and otherwise,

.1 Provide adequate clearances for installation and maintenance of equipment.

.2 Install work to permit removal of parts requiring periodic replacement or maintenance.

.3 Arrange pipes, ducts, raceways and equipment to permit ready access to valves, cocks, traps, starters, motors, and control components.

.4 Doors and access panels shall be kept clear.

.5 Utilize space efficiently so that adequate accessibility is retained for future maintenance, repairs, modifications and additions.

.6 Check the locations selected for all sprinkler heads and check the Architectural reflected ceiling plans to prevent conflicts between the trades.

.7 Contractor is cautioned that, where specific dimensions are not indicated or where Drawings are schematic in nature, as with most Electrical and Mechanical Drawings, Contractor shall have sole responsibility to coordinate the work to meet this requirement.

1.9.5 Make adequate provisions to accommodate items scheduled for later installation.

1.9.6 Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work and completion within the specified Contract duration. Such administrative activities include, but are not limited to, the following:

.1 Preparation of Contractor's Construction Schedule.

.2 Installation and removal of temporary facilities and controls.

.3 Delivery and processing of submittals.

.4 Progress meetings.

.5 Start-up, check-out, and final acceptance of systems.

.6 Project closeout activities.

.7 Protection of existing and new work.

1.9.7 Changes required in the Work of the Contract, caused by the Contractor’s neglect to coordinate the work with others shall be made at the Contractor’s own expense.

1.10 COORDINATION DRAWINGS

1.10.1 Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1.10.2 Contractor to submit to the Owner’s Representative, in AutoCAD format, coordination drawings, drawn accurately to a scale large enough to indicate and resolve conflicts.

1.10.3 Indicating the functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

1.10.4 Do not base coordination drawings on standard printed data.

1.10.5 Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.

1.10.6 Show location and size of access doors required for access to concealed dampers, valves, and other controls.

1.10.7 Indicate required installation sequences.

1.10.8 Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.

1.10.9 Minor dimension changes and difficult installations will not be considered changes to the Contract.

1.10.10 Owner's Representative will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination. If Owner's Representative determines that coordination drawings are not being prepared in enough scope or detail, or are otherwise deficient, Owner's Representative will so inform Contractor, who shall make changes as directed and resubmit.

1.11 CLOSEOUT PROCEDURES

1.11.1 Notify Owner's Representative when Work is considered ready for Substantial Performance.

1.11.2 Accompany Owner's Representative on preliminary inspection to determine items listed for completion or correction.

1.11.3 Comply with Owner's Representative's instructions for correction of items of Work listed in executed certificate of Substantial Performance and for access to Owner-occupied areas.

1.11.4 Notify Owner's Representative of instructions of items of Work determined in Owner's Representative's final inspection.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

1.1.1 Section 01 77 00 - Closeout Procedures.

1.2 SCHEDULES REQUIRED

1.2.1 Submit schedules as follows:

.1 Construction Progress Schedule.

.2 Submittal Schedule for Shop Drawings and Product Data.

.3 Submittal Schedule for Samples.

.4 Product Delivery Schedule.

.5 Cash Allowance Schedule for purchasing Products.

.6 Shutdown or closure activity.

1.3 FORMAT

1.3.1 Prepare schedule in form of a horizontal bar chart.

1.3.2 Provide a separate bar for each major item of work, trade or operation.

1.3.3 Split horizontally for projected and actual performance.

1.3.4 Provide horizontal time scale identifying first work day of each week.

1.3.5 Format for listings: chronological order of start of each item of work.

1.3.6 Identification of listings: By Systems description.

1.4 SUBMISSION

1.4.1 Submit initial format of schedules within 15 working days after award of Contract.

1.4.2 Submit schedules in electronic format as PDF files.

1.4.3 Owner’s Representative will review schedule and return review copy within ten (10) working days after receipt.

1.4.4 Resubmit finalized schedule within seven (7) working days after return of review copy.

1.4.5 Submit revised progress schedule with each application for payment.

1.4.6 Distribute copies of revised schedule to:

.1 Job site office.

.2 Subcontractors.

.3 Other concerned parties.

1.4.7 Instruct recipients to report to Contractor within ten (10) working days, any problems anticipated by timetable shown in schedule.

1.5 CRITICAL PATH SCHEDULING

1.5.1 Include complete sequence of construction activities.

1.5.2 Include dates for commencement and completion of each major element of construction as follows.

.1 Site clearing/Demolition.

.2 Site utilities.

.3 Service Interruptions

.4 Foundation Work.

.5 Structural framing.

.6 Subcontractor Work.

.7 Temporary Work.

.8 Finishes.

1.5.3 Show projected percentage of completion of each item as of first day of month.

1.5.4 Indicate progress of each activity to date of submission schedule.

1.5.5 Show changes occurring since previous submission of schedule:

.1 Major changes in scope.

.2 Activities modified since previous submission.

.3 Revised projections of progress and completion.

.4 Other identifiable changes.

1.5.6 Provide a narrative report to define:

.1 Problem areas, anticipated delays, and impact on schedule.

.2 Corrective action recommended and its effect.

.3 Effect of changes on schedules of other prime contractors.

1.6 SUBMITTALS SCHEDULE

1.6.1 Include schedule for submitting shop drawings, product data, and samples.

1.6.2 Indicate dates for submitting, review time, resubmission time, last date for meeting fabrication schedule.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 SECTIONS INCLUDE

1.1.1 Shop drawings and product data.

1.1.2 Samples.

1.2 RELATED SECTIONS

1.2.1 Section 01 32 00 – Construction Progress Documentation.

1.2.2 Section 01 45 00 – Quality Control

1.2.3 Section 01 78 00 – Closeout Submittals

1.3 ADMINISTRATIVE

1.3.1 This section specifies general requirements and procedures for contractor's submissions of shop drawings, product data, samples and mock-ups to Owner's Representative for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

1.3.2 Do not proceed with work until relevant submissions are reviewed by Owner's Representative.

1.3.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

1.3.4 Where items or information is not produced in SI Metric units converted values are acceptable.

1.3.5 Review submittals prior to submission to Owner's Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. **Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.**

1.3.6 Notify Owner's Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

1.3.7 Verify field measurements and affected adjacent Work are coordinated.

1.3.8 Contractor's responsibility for errors and omissions in submission is not relieved by Owner's Representative's review of submittals.

1.3.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Owner's Representative review of submission, unless Owner's Representative gives written acceptance of specific deviations.

1.3.10 Make any changes in submissions which Owner's Representative may require consistent with Contract Documents and resubmit as directed by Owner's Representative. When resubmitting, notify Owner's Representative in writing of revisions other than those requested.

1.3.11 Notify Owner's Representative, in writing, when resubmitting, of any revisions other than those requested by Owner's Representative.

1.3.12 Keep one reviewed copy of each submission on site.

1.4 SUBMITTALS

1.4.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

1.4.2 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.

1.4.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

1.4.4 Allow ten (10) working days for Owner's Representative review of each submission.

1.4.5 Adjustments made on shop drawings by Owner's Representative are not intended to change contract price. If adjustments affect value of Work, state such in writing to Owner's Representative immediately after receipt of approval of shop drawings. If value of work is to change a change order must be issued prior to proceeding with work.

1.4.6 Structural Attachments:

.1 Make changes in shop drawings as Owner's Representative may require, consistent with Contract Documents. When resubmitting, notify Owner's Representative in writing of revisions other than those requested.

1.4.7 Accompany submissions with transmittal letter, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Identification and quantity of each shop drawing, product data and sample.

.5 Other pertinent data.

1.4.8 Submissions shall include:

.1 Date and revision dates.

.2 Project title and number.

.3 Name and address of:

.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

.4 Contractor's stamp, signed by Contractor’s authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

.5 Details of appropriate portions of Work as applicable:

.1 Fabrication.

.2 Layout, showing dimensions, including identified field dimensions, and clearances.

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to adjacent work.

1.4.9 After Owner’s Representative review, distribute copies.

1.4.10 Submit one electronic copy in PDF format of shop drawings for each requirement requested in specification Sections and as Owner’s Representative may reasonably request.

1.4.11 Delete information not applicable to project.

1.4.12 Supplement standard information to provide details applicable to project.

1.4.13 Cross-reference product data information to applicable portions of Contract Documents.

1.4.14 If upon review by Owner’s Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of work may proceed.

1.4.15 Samples: examples of materials, equipment, quality, finishes, workmanship. Label samples with origin and intended use.

1.4.16 Notify Owner's Representative in writing, at time of submission of deviations in samples from requirements of contract documents.

1.4.17 Where colour, pattern or texture is criterion, submit full range of samples.

1.4.18 Adjustments made on samples by Owner's Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Owner's Representative prior to proceeding with Work.

1.4.19 Make changes in samples, which Owner's Representative may require, consistent with Contract Documents.

1.4.20 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4.21 Where shop drawings are requested to be stamped and signed by a Professional Engineer, they shall be registered or licensed within the Applicable Jurisdiction of the subject Project.

1.5 MOCK-UPS

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

1.6 PROGRESS PHOTOGRAPHS

1.6.1 Progress photograph to be electronically formatted and labelled as to location and view.

1.7 SHOP DRAWINGS REVIEW

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

1.8 STRUCTURAL ATTACHMENTS

1.8.1 Contractor to engage a third party Professional Structural Engineer, licensed to practice within the Applicable Jurisdiction of the subject Project, for submission of stamped and signed shop drawings indicating acceptable mounting procedures for all equipment which is suspended, mounted or otherwise attached. The Structural Engineer to also verify correct installation of the equipment.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 REFERENCES

1.1.1 Canadian Standards Association (CSA)

.1 CAN/CSA-Z259.1, Body Belts and Saddles for Work Positioning and Travel Restraint.

.2 CAN/CSA-Z259.10, Full Body Harnesses.

.3 CAN/CSA-Z259.11, Energy Absorbers and Lanyards.

.4 CAN/CSA-Z259.2.1, Fall Arresters, Vertical Lifelines and Rails.

.5 FCC No. 301, Standard for Construction Operations.

.6 CSA Z275.2, Occupational Safety Code for Diving Operations.

.7 CSA Z275.4, Competency Standard for Divers Operations.

.8 CSA Z797, Code of Practice for Access Scaffold.

1.1.2 FCC No. 302, Standard for Welding and Cutting.

1.1.3 Transportation of Dangerous Goods Act & Regulations.

1.1.4 Ontario Occupational Health and Safety Act, Amended

1.1.5 Consolidated Ontario Regulations 1149 WHMIS Regulations under the Occupational Health and Safety Act.

1.1.6 Consolidated Ontario Occupational Health and Safety Regulations under the Occupational Health and Safety Act.

1.1.7 Canada Labour Code, Part 2.

1.1.8 National Building Code of Canada.

1.1.9 Department of Transportation and Infrastructure Occupational Health and Safety Manual.

1.1.10 Department of Transportation and Infrastructure Contractor Safety Management Program.

1.2 GENERAL

1.2.1 All work to be performed in accordance with the requirements of the Ontario Occupational Health and Safety Act and Regulations as amended, the Department of Transportation and Infrastructure's Contractor Safety Management Program and any specified Contract requirements.

1.2.2 The Contractor shall comply with and enforce compliance by employees, subcontractors, suppliers and visitors with all safety requirements of the Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with the Site Specific Health and Safety Plan (SSSP).

1.2.3 The Contractor is responsible for all work coordination at the project site, safety oversight, and must maintain full ownership and control of safety within the project area at all times.

.1 The Contractor shall ensure co-ordination of work schedules and tasks, and communication thereof for the purpose of ensuring health and safety on the worksite.

1.2.4 Owner may perform project due diligence, site visits, safety monitoring activities, make suggestions or recommendations for improvement, and/or request changes in how work is performed. Notwithstanding, the Contractor has full responsibility, authority, and accountability for safely performing all work on the project site and/or under the project. Owner solely relies on the Contractor to know how to safely perform all Work including making appropriate decisions on Owner recommendations or requests.

1.2.5 The Contractor shall ensure that in addition to those requirements set forth in the OHS Act and Regulations, all persons, including those employed by the Contractor or their subcontractors, working on projects for DTI shall wear the following mandatory Personal Protective Equipment at ALL times while working on the project.

.1 CSA approved safety boots meeting the CSA Z195 Standard.

.2 CSA approved hard hat meeting the CSA Z94.1 Standard.

.3 CSA approved safety glasses meeting CSA Z94 Standard.

.4 High visibility apparel as defined in the OHS Regulations.

.5 Where noise exceeds standards set out in the OHS Regulations hearing protection shall be worn, and hearing conservation program implemented.

.6 Other personal protective equipment, as may be required by the work tasks, hazard assessments or the Contractor, depending on duties being performed.

1.3 SUBMITTALS

1.3.1 At least 10 (ten) working days prior to commencing any site work: submit to Owner copies of:

.1 A complete Site Specific Health and Safety Plan (SSSP).

1.3.2 Review and acceptance of the SSSP and other submitted documents by the Owner shall only be viewed as acknowledgement that the contractor has submitted the required documentation under this specification section.

1.3.3 Owner makes no representation and provides no warranty for the accuracy, completeness and legislative compliance of the Site Specific Health and Safety Plan and other submitted documents by this acceptance.

1.3.4 Responsibility for errors and omissions in the SSSP and other submitted documents is not relieved by acceptance by Owner.

1.3.5 Contractor to complete and submit to the Construction Manager, on a monthly basis, the Monthly Safety Performance Form, indicating monthly OHS performance indicators, OHS activities, training information and equipment maintenance.

1.4 OCCUPATIONAL HEALTH AND SAFETY (SITE SPECIFIC HEALTH AND SAFETY PLANS)

1.4.1 Conduct operations in accordance with latest edition of the Newfoundland Occupational Health and Safety (OHS) Act and Regulations, with specific reference to codes and standards referenced therein, the Department of Transportation and Infrastructure Occupational Health and Safety Manual, and the Department of Transportation and Infrastructure Contractor Safety Management Plan

1.4.2 Prepare a detailed Site Specific Health and Safety Plan (SSSP) that shall identify, evaluate and control job specific hazards through a detailed hazard assessment of the tendered project outlining phases of the project and hazards/controls associated with specific work, equipment, locations and tasks associated with the work conducted during each phase of the project and the necessary control measures to be implemented for managing hazards.

1.4.3 The plan shall also ensure adequate policies, procedures and safe work practices are in place to manage hazards identified in the hazard assessment that cannot be addressed through engineering controls.

1.4.4 It is the responsibility of the Contractor to submit only one SSSP that incorporates all relevant portions of their subcontractors' safety documentation.

1.4.5 For projects exceeding thirty (30) days, provide a copy of the SSSP upon request to Occupational Health and Safety Division, Digital Government and Service, Province of Ontario and the Owner.

1.4.6 The written SSSP shall incorporate the following:

.1 Hazard assessment results.

.2 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.

.3 An organizational structure, in the form of an organizational chart with contact information of the key positions, which shall establish the specific chain of command and specify the overall responsibilities of contractor's employees at the work site.

.1 The chart shall also include relevant information for all subcontractors.

.4 Identification of the designated qualified work coordinator(s) (i.e. Supervisor, Contractor Safety Representative) as per Section 21 of the OHS Regulations.

.5 A comprehensive work plan which shall:

.1 Outline the phases of the Project and the required tasks, equipment, positions, resources and objectives for each phase, including all subcontracted work.

.2 Conduct a detailed hazard assessment of each project phase, including all subcontracted work, taking into consideration the

objectives, tasks, equipment, positions, resources, training, etc.

.3 Identify the controls required for all identified hazards and project phases that may include engineering controls, policies, procedures, equipment, safe work practices, training and communication with staff, etc.

.6 Establish personnel requirements for implementing the plan and controls and establish site-specific training and notification requirements and schedules.

.7 A personal protection equipment (PPE) Program which shall detail PPE:

.1 Selection criteria based on site hazards as determined by the hazard assessment.

.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.

.8 An emergency response procedure, refer to clause 1.6 Supervision and Emergency Response Procedure of this section for requirements.

.9 A hazard communication program for informing workers, visitors and individuals outside of the work area as required. This will include but not be limited to a visitor safety and orientation policy and program that will include education on hazards, required PPE and accompaniment while on site.

.1 This program shall also take into consideration the safety of the general public that may come in contact with the work site and appropriate measures for notification and safety

.10 A hearing conservation program in accordance with Part VI, Section 68 of the OHS Regulations.

.11 A vehicle inspection matrix (tabular or spreadsheet format) showing required inspection type and date of most recent inspection for all powered mobile equipment (including light vehicles) that will be used in fulfilling the terms of the contract, including rented and the subcontractor's equipment. Upon request, the Contractor shall provide to the Owner, individual inspection forms that at a minimum state that the equipment is in a safe operating condition and is signed by a qualified journeyperson mechanic..

.12 A complete listing of employee names, their driver's license classification, expiry date, endorsements and the type of equipment that they are qualified to operate for the complete scope of work for this project. The Driver's License Number should not be provided as this is confidential information. Provision of the License Number may breach *PIPEDA* - the Personal Information Protection and Electronic Documents Act. (Federal Act) or *ATIPPA - Access to Information and Protection of Privacy Act* - Part IV. (Provincial Act of Ontario). This shall also include documentation where required of certification in power line hazards.

.13 An acceptable parking policy for all powered mobile equipment to be used on this project. The policy shall, at a minimum, be based on a hazard assessment that considers factors such as equipment type, potential for roll over, load capacity of the parking area, pedestrian and vehicular traffic, and potential for equipment tampering, equipment energy, and equipment contact with power lines.

.14 A fall protection plan, if necessary. Refer to clause 1.22 Working at Heights.

.15 A dust suppression management program, if necessary.

.16 An assessment of all possible risks of violence for the project and corresponding control measures. Considerations should include location and circumstances of the site, previous history of incidents and or possible triggers.

.17 General safety rules.

1.4.7 Periodically review and modify as required each component of the SSSP when a new hazard is identified during completion of work and when an error or omission is identified in any part of the SSSP.

1.4.8 Review the completeness of the hazard assessment 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, evaluating and managing any report of actual or potential hazards.

.2 Clearly define accident incident investigation procedures.

.3 Clearly define policy and processes for early and safe return to work.

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

1.4.9 Implement all requirements of the SSSP.

.1 Ensure that every person entering the project site is informed of requirements under the SSSP.

.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 SSSP.

1.4.10 Conduct site orientations to advise workers of the hazards on their worksites. Site orientations to be performed by the party most familiar with the hazards of the worksite.

1.4.11 Hold regular toolbox talks, with additional talks if there are changes to the job.

1.4.12 Conduct weekly site inspections of the worksite.

1.5 SUPERVISION AND EMERGENCY RESCUE PROCEDURE

1.5.1 Develop an organizational structure which establishes a specific chain of command and overall responsibilities of all employees at the work site.

1.5.2 Carry out work under the direct supervision of competent persons responsible for safety by ensuring the work complies with the appropriate section of OHS Act and Regulations

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

.1 Any person assigned to supervisory duties shall not conduct significant work in relation to the contract that inhibits them from the ability to properly supervise the work site.

1.5.4 Ensure the site supervisor has complete understanding, working knowledge and familiarity with the SSSP, applicable codes and standards as well as the OHS Act and Regulations.

1.5.5 Ensure the site supervisor fully implements, enforces, and monitors the SSSP.

1.5.6 Prior to the start of work, ensure that the site supervisor(s) have the training, knowledge, and understanding in:

.1 Project tasks and construction activities.

.2 Hazard recognition evaluation and control.

.3 Development and implementation of safe work practices and procedures.

.4 Accident incident investigations and reporting.

.5 Workplace violence and harassment prevention.

.6 Equipment maintenance and inspections required for preventive safety.

.7 Care and maintenance of PPE to be used on site.

.8 Standard First Aid training certified by WorkplaceNL.

.9 WHMIS 2015.

1.5.7 The Site Supervisor shall:

.1 Be responsible for project safety by ensuring the work complies with all requirements of the SSSP and with the appropriate section(s) of OHS Act and Regulations, latest edition.

.2 Prior to mobilization on site, hold a pre-start Health and Safety meeting with the Contractors, subcontractors, and Owner to review of the SSSP including all its contents.

.3 Be responsible for the delivery and documentation of the site safety orientations and ensure that personnel who have not been oriented are not permitted to enter the site. This applies to all workers (Contractor, Subcontractor, and Department), and visitors.

.4 Advise of the health and safety hazards for the work site, provide written or verbal instructions of any precautions to be taken to protect everyone at the work site and ensure that the applicable personal protective equipment is used and worn on site at all times.

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

.6 Address all safety concerns brought to their attention in a timely manner depending on the severity of the hazard.

.7 Be responsible for the maintenance of a daily log of inspections, meetings, infractions and mitigating measures. The log is to be filed daily and copies provided to the Owner as requested.

.8 Be responsible to log, investigate, track and follow-up on mitigations for all near misses, incidents and/or accidents.

.9 Promote employees' right to work in a respectful, harassment-free, and psychologically healthy and safe work environment. Assist the Owner to investigate incidents of workplace violence or harassment carried out against a DTI employee by contractor or sub-contractor employees.

.10 If required for the project, coordinate with and support the efforts of the on-site safety representative.

1.5.8 Assign a dedicated on-site safety representative to assist the Site Supervisor during the completion of high-risk activities. This person shall have training, knowledge, and understanding regarding the activity(s) being completed. High-risk activities may include, but are not limited to:

.1 Heavy lift operations which includes items greater than 1000 kg or which may need an engineered lift plan due to other identified risk factors.

.2 Lift operations that occur closer than 10 m of energized power lines or close proximity to moving traffic, public and residential areas, or other sensitive locations.

.3 When greater than three (3) employers are working in close proximity at the same time. Close proximity execution means any time the operations of each employer are close enough to directly influence or add risk to another employer.

.4 Working within or near highly populated residential areas when there is an appreciable ongoing risk to the public that needs continual safety oversight.

.5 When a complex traffic control plan is needed in high volume areas.

.6 Work involving confined space entry.

.7 Working with or near toxic and hazardous substances.

.8 Any other high-risk activity identified through hazard/risk assessment by the Contractor or by the Owner.

.9 In such instances, the Contractor may request and the Department may agree that such dedicated safety representation is not needed if the Contractor demonstrates there are adequate safety controls in place to mitigate the risk.

1.5.9 Provide a suitable means of communications and check–in for workers required to work alone.

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

1.5.11 The emergency response plan shall address, as a minimum:

.1 Pre-emergency planning (included the assessment of controls to reduce the likelihood of such an emergency if possible).

.2 Personnel roles, lines of authority and communication (include a communication list of all emergency services in the immediate and surrounding areas).

.3 Emergency recognition and prevention (identification of each potential type of emergency and evaluation of requirements for response).

.4 Required communication equipment including landlines, mobile phones, radios, satellite phones, and/or other equipment needed to ensure appropriate emergency communications in the area of the Project.

.5 Safe distances and places of refuge.

.6 Site security and control.

.7 Evacuation routes and procedures.

.8 Decontamination procedures which are not covered by the site specific safety and health plan.

.9 Emergency medical treatment and first aid.

.10 Emergency alarm, notification and response procedures including procedures for reporting incidents to local, provincial and federal government departments.

.11 PPE and emergency equipment.

.12 Procedures for handling emergency incidents.

.13 Procedures and protocol for working alone and/or remote working.

.14 Site specific emergency response training requirements and schedules.

.15 For diving operation, include procedures for:

.1 Managing deteriorating environmental conditions.

.2 Managing unexpected weather or sea-state condition.

.3 Evacuation of diver(s) under pressures greater than atmospheric pressure.

.4 In-water emergency transfers.

.5 Managing failing of equipment below the surface that impairs the ability of a diver to complete a dive.

.6 Managing failure of any major component of diving plant or equipment.

.7 Emergency signalling between divers involved in the diving program and between the diver(s) and the attendants using umbilical, tethers or other suitable methods.

.8 Mobilizing stand-by divers.

.9 Mobilizing crafts, stand-by boats and any other devices to be used for rescue.

.10 Contacting evacuation, rescue, treatment facilities and medical services that will be used in the diving program.

.11 Operation of emergency power and lighting facilities.

1.5.12 The emergency response procedures shall be rehearsed regularly as part of the overall training program and the results documented. The frequency at which all aspects of the emergency response plan will be rehearsed must be stated.

1.5.13 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 Occupational Health and Safety First Aid Regulations.

1.6 CONTRACTORS SAFETY REPRESENTATIVE

.1 The contractor shall employ a Contractor's Safety Representative (CSR) who shall have as a minimum successfully completed the following training, and must have current credentials for those that have expiration dates:

.1 Training in hazardous materials management and response/protocols.

.2 Training in the use, maintenance of fall protection systems certified by Workplace NL at a minimum.

.3 Training in the inspection of scaffolding in accordance with CSA Z797.

.4 Training in confined space entry protocols, techniques and rescue plans, certified by Workplace NL at a minimum.

.5 Supervisory training.

.6 Training in records and statistics.

.7 Training is hazard identification, inspections, analysis and control.

.8 Training in WHMIS 2015.

.9 Training in health and safety program content.

.10 Training in investigations and reporting.

.11 Training in occupational health/hygiene.

.12 Training in employee training and communication.

.13 Training in Emergency Preparedness and First Aid.

.14 A working knowledge of, and experience satisfactory to the Department, using the occupational safety and health legislation and regulations specific to Ontario.

.15 Experience, satisfactory to the Department, with the safe work practices required for execution of the work and operation of equipment specific to the project.

.16 Experience, satisfactory to the Department, in developing and monitoring site safety and housekeeping policies.

.17 Experience, satisfactory to the Department, in developing and monitoring a preventative maintenance and inspection program for Construction Site Equipment.

1.6.2 The CSR shall:

.1 Be responsible for developing, implementing, daily enforcement, monitoring and updating of the SSSP.

.2 Be responsible for the delivery of the site safety orientation and ensure that the personnel who have not been orientated are not permitted to enter the site. This applies to workers, inspectors and visitors.

.3 Report directly to and be under direction of the Site Superintendent or Contractor’s Project Manager.

.4 Prior to mobilization on-site, hold an orientation meeting with the contractors, subcontractors and Owner to review project occupational health and safety. Include but not limit meeting to a review of:

.1 The SSSP.

.2 Construction Safety Measures.

.3 Supervision and Emergency Rescue Procedures.

.4 Hazard Assessments

.5 Maintain a daily log of inspections, meetings, infractions and mitigating measures. Log is to be filed daily and copies to be provided to the Site Superintendent and Owner.

.6 The CSR shall have:

.1 Formal training in OHS Management (degree, diploma, or certificate) combined with at least two (2) years of relevant experience, or

.2 A designation of National Construction Safety Officer (NCSO), Construction Safety Officer (CSO), Canadian Registered Safety Professional (CRSP), Canadian Registered Safety Technician (CRST), or Certified Health and Safety Consultant (CHSC), or other similar designation.

1.7 HEALTH AND SAFETY COMMITTEE

1.7.1 Establish an Occupational Health and Safety Committee where ten or more workers are employed on the job site for greater than 30 days as per the OHS Act and Regulations.

1.7.2 Committee members shall receive training from a Workplace recognized training provider.

1.7.3 Provide a copy of all committee minutes with the Contractor's Monthly OHS Performance Report.

1.8 CONTRACTOR ROLES AND RESPONSIBILITIES

1.8.1 Ensure that their organization is staffed appropriately to ensure completion of project tasks and all necessary safety related duties and responsibilities.

1.8.2 Ensure co-ordination of work schedules and tasks, and communication thereof for the purpose of ensuring health and safety on the worksite.

1.8.3 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.

1.8.4 Develop a SSSP that thoroughly assesses the health and safety hazards of each project phase, including all subcontracted work.

1.8.5 Implement all requirements of the SSSP. The Contractor shall take all necessary measures to immediately implement any engineering controls, administrative controls, personal protective equipment required or termination of work procedures to ensure compliance with the SSSP and the OHS Act and Regulations. All measures should be immediately communicated to staff.

1.8.6 Comply with and enforce compliance by employees, subcontractors, suppliers and visitors with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with SSSP.

1.8.7 Where safety risks exist, the contractor must stop the work until such time as the risk can be mitigated to a safe level.

1.8.8 Take appropriate steps to ensure that the hazards are mitigated to a safe level, workers are notified of the hazards and how to protect themselves. As well, workers must be provided with any new safe work practices or information regarding mitigation of the risk.

1.8.9 Periodically review and modify the SSSP as required including but not limited to when a new hazard is identified during completion of work or when an error or omission is identified in any part of the SSSP.

1.8.10 Support/permit periodic inspections of the Contractor's work by the Owner to maintain compliance with the SSSP. Inspections may include visual inspections of the site and documentation, as well as testing and sampling as required.

1.8.11 Be responsible for any and all costs associated with delays as a result of the Contractor's failure to comply with the requirements outlined in this Section or the OHS Act and Regulations.

1.8.12 Ensure that all workers receive necessary training as per the training matrix contained in the SSSP prior to the start of work. Maintain training records in a tabular format or spreadsheet for all employees on the project site and complete periodic reviews to ensure that necessary re-certifications are completed prior to expiration dates.

1.8.13 Ensure all equipment, vehicles, tools, or other devices necessary throughout the Project are suitable for the task and are inspected and maintained in accordance with the manufacturers' specifications and/or CSA standards adopted by the OHS Regulations.

1.8.14 Be responsible to ensure that site inspections have been completed at no less than one (1) week intervals. These site inspections shall include risk assessments where the nature of the ongoing work or tasks associated with the work increase in risk or significantly change due to phases in the project or project progression.

1.8.15 Ensure that toolbox meetings are held with staff no less than once per week and shall include review of safety related information that is pertinent to the safety of employees.

1.8.16 Ensure that all toolbox meetings, site inspections, risk assessments, OHS Committee meetings and any OHS Directives or reports are documented and submitted with the Contractor's Monthly OHS Performance Report.

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

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

1.8.19 Retain copies of all completed hazard assessments at the project site and provide a copy to the Owner. Copies of any hazard assessments not included in the original SSSP must be submitted immediately to the Owner and noted on the Contractor's Monthly OHS Performance Report.

1.8.20 Promote the employees' right to work in a respectful, harassment-free, and psychologically healthy and safe work environment. Assist the Owner to investigate incidents of workplace violence or harassment carried out against a DTI employee by contractor or sub-contractor employees.

1.9 UNFORSEEN HAZARDS

1.9.1 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 verbally and in writing.

1.10 REPORTING AND INVESTIGATION

1.10.1 The Contractor shall adhere to a documented incident, hazard, safety reporting, and investigation process. The system shall:

.1 Ensure all hazards, near misses, incidents, accidents, injuries, equipment damage are recorded and properly investigated.

.2 Rank actual and potential severity of observations and report all high potential near misses, accidents, and incidents immediately to the Owner and to the OHS Division of Digital Government and Service NL.

.3 Advise the Owner and the OHS Division of Digital Government and Service NL verbally and in writing immediately of any incident that results in serious injury to a person or results in the death of a person; or had the reasonable potential to cause serious injury.

.4 Provide a copy of all notifications made to the OHS Division of Digital Government and Service to Transportation and Infrastructure.

.5 Where life safety risks or other high potential risks exists, the Contractor must stop work until such time as the risk can be mitigated to a safe level.

.6 Make appropriate steps to ensure that the hazards are mitigated to a safe level, workers are notified of the hazards and how to protect themselves. Additionally, workers must be provided with any new safe work practices or information regarding mitigation of the risk.

1.11 INSTRUCTION AND TRAINING

1.11.1 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.

1.11.2 Contractors shall develop an OHS training program that reflects OHS Legislative requirements and specific safety hazards based on Project work

1.11.3 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.

.7 Workers must receive training from a WorkplaceNL recognized training provider as outlined in the OHS legislation (i.e. fall protection, confined space entry, power line hazards, traffic control persons training).

.8 Training in the use, care and maintenance of PPE to be used on site.

.9 Training in the Contractor’s emergency response plan for the Project. Workers engaged in fall arrest or confined space rescue operations will require specific training for the tasks involved.

.10 All workers at site must receive training in Workplace Violence and Harassment Prevention.

.11 Training in WHMIS 2015.

.12 Safety and health hazards associated with working in extreme weather conditions (i.e. heat/cold hazards).

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

1.11.5 Provide copies of all training records to Owner for review, before a worker is to enter the work site. Site training records must be in tabular or spreadsheet format, stating employee name, occupation, required training, date that training was obtained and expiry date. This must be signed and dated by a member of the Contractor’s management team.

1.11.6 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 SSSP.

.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.

.6 Accompanied while on site, and provided with the appropriate PPE.

1.11.7 All workers will be instructed and trained on the hazards associated with work they will perform and how to protect themselves. This will include a review of all safe work practices, the reporting and documentation of hazards, reporting accidents and injuries as well as, formal training in areas of high risk (i.e. fall protection, power line hazards, traffic control persons training).

1.11.8 The work site shall have the appropriate number of persons trained in emergency and Standard First Aid according to the First Aid Regulations.

1.12 CONSTRUCTION SAFETY MEASURES

1.12.1 Observe construction safety measures of National Building Code, latest edition, Federal and Provincial Government, OHS Act and Regulations, Workplace NL and Municipal Authority provided that in any case of conflict or discrepancy more stringent requirements shall apply.

1.12.2 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 SSSP.

1.12.3 Provide Owner with copies of all orders, directions and any other documentation, issued by the Occupational Health and Safety Division, Digital Government and Service NL, immediately after receipt.

1.12.4 Forward copies of all orders, directions or any other documentation immediately after receipt.

1.13 POSTING OF DOCUMENTS

1.13.1 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.

1.14 HEALTH AND SAFETY MONITORING

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

1.14.2 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

1.15.1 For projects exceeding thirty (30) days or more, the contractor shall, prior to the commencement of work, notify in writing the Occupational Health and Safety Division, Digital Government and Service with the following information and provide a copy to the Owner:

.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 SSSP, if requested.

1.16 CORRECTION OF NON-COMPLIANCE

1.16.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Owner.

1.16.2 Provide Owner with written report of action taken to correct non-compliance of health and safety issues identified within ten (10) working days.

1.16.3 Owner may stop work if non-compliance of health and safety regulations is not corrected.

1.17 WHMIS 2015

1.17.1 Ensure that all controlled products are in accordance with the Workplace Hazardous Materials Information System (WHMIS 2015) Regulations and Chemical Substances of the OHS Act and Regulations regarding use, handling, labelling, storage, and disposal of hazardous materials.

1.17.2 Deliver copies of relevant Safety Data Sheets (SDS) to job site and the Owner. The SDS 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. All SDS should be located in accessible locations for all workers and visitors throughout the site, bound and organized in binders.

1.17.3 Train workers required to use or work in close proximity to controlled products as per OHS Act and Regulations. This must be documented as part of the on-site orientation and a copy provided to the Owner.

1.17.4 Label controlled products at jobsite as per OHS and Regulations and WHMIS.

1.17.5 Provide appropriate emergency facilities as specified in the SDS 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.

1.17.6 Contractor shall provide appropriate personal protective equipment as specified in the SDS 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.

1.17.7 No controlled products are to be brought on-site without prior approved SDS.

1.17.8 The SDS are to remain on site at all times and are accessible to everyone on site.

1.18 OVERLOADING

1.18.1 The Contractor's Full Time CSR and/or Site Superintendent shall ensure no part of work or associated equipment is subjected to loading that will endanger its safety or will cause permanent deformation.

1.18.2 Ensure equipment operations follow manufacturer's operating manual.

1.19 FALSEWORK

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

1.20 SCAFFOLDING

1.20.1 Design, erect, inspect, operate, modify, and dismantle scaffolding in accordance with CSA Z797, Part XI: sections 147-249 of the OH&S Act and Regulations, and the scaffold manufacturer's written instructions.

1.20.2 Provide trained and certified Competent Scaffold Erectors for all scaffold erection, modification and dismantling. Training certification must be valid at time of erection, modification and dismantling of scaffold.

1.20.3 Conduct and document daily inspections of scaffolding by trained and certified Competent Scaffold Inspectors or Erectors. Training certification must be valid at the time of inspection.

.1 Records and copies of these inspections shall be kept on site and provided upon request to the Department of Transportation and Infrastructure officials, Owner, etc.

1.20.4 Scaffolding inspection reports may be required to be provided with the Contractor's Monthly OHS Performance Reports, at the discretion of the Owner.

1.20.5 Provide a scaffold tagging system as described in CSA Z797.

1.20.6 Ensure that all industry best practices for safe scaffold usage, including fall protection, proper loading, safe access, electrical hazards, exit door management and other concerns are strictly adhered to.

1.21 WORKING AT HEIGHTS

1.21.1 Develop a site specific fall protection plan, including a rescue plan, and provide it to the Owner as a part of the SSSP when fall protection systems are required during the course of the Project

1.21.2 Ensure that fall restraint or fall arrest devices are used by all workers working at elevations greater than 3.05 meters above grade or floor level in accordance with CSA Z259, where alternate fall protection systems are not provided in accordance with Occupational Health and Safety Act and Regulations.

1.21.3 All workers performing work at height and who will be required to utilize a fall arrest system must be trained in a fall protection program certified by the Workplace NL. Training must be current and valid at the time of use.

1.21.4 Prior to working at height workers shall be instructed in a Contractor Safe Work Practice for working at height and associated Rescue Plan for working at heights, developed specific to the work to be performed, locations and risks.

1.21.5 Maintain a list of all persons trained in WorkplaceNL certified fall protection training on site. To be combined with other training records as required in a tabular or spreadsheet format listed throughout this Section.

1.21.6 Ensure regular inspections of all fall protection and fall arrest equipment are completed and that records are maintained and kept on site. Daily inspections of fall restraint and horizontal fall protection/arrest systems shall be conducted.

1.21.7 Ensure that manufacturer’s specifications for engineered fall protection/arrest/restraint systems are kept on site at all times.

1.21.8 Develop Working from Height Safe Work Practices specific to the Work, location and risks, and ensure the workers receive specific instruction regarding the work tasks and associated rescue plans.

1.21.9 Ensure that rescue equipment for fall rescues is kept in close proximity to workers working at height.

1.21.10 Where necessary the Contractor shall ensure that adequate protection from falling debris is addressed in site specific safety plans, this may include debris nets, barriers, etc.

1.22 PERSONAL PROTECTIVE EQUIPMENT

1.22.1 Ensure workers on the jobsite use personal protective equipment appropriate to the hazards identified in the SSSP and those workers are trained in the proper care, use, and maintenance of such equipment.

1.22.2 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. PPE must also be fitted for the worker.

1.22.3 Provide workers and visitors to the site with proper respiratory protection equipment.

.1 No work shall be performed in an area where an airborne contaminant exceeds recommendations of the ACGIH, do not meet the appropriate standards for the specific contaminants or are not in accordance with the OHS regulations.

.2 Respiratory protection shall be provided in accordance with the requirements of the Occupational Health and Safety Division, Digital Government and Service NL and these specifications.

.3 Establish, implement and maintain a respirator inspection and maintenance program in accordance with the CSA standard identified in the OHS Regulations.

.4 Copies of all respirator owners' maintenance manuals shall be kept at all times at the contractor's site office.

1.22.4 Provide and maintain a supply of dermal protection equipment to allow visitors and all workers proper dermal protection.

.1 Dermal protection shall be sufficient to act as a protective barrier between the skin and an airborne contaminant or hazardous material. Dermal protection shall also be provided for all physical hazards.

.2 Dermal protection equipment shall not be used after exceeding 75% of the break through time. The break through time shall be based on the contaminant which requires the least amount of time to break through the protective equipment

.3 Copies of all dermal protection user specifications, owners and maintenance manuals shall be kept at all times at the contractor's site office.

.4 Establish, implement and maintain air inspection program to ensure proper dermal protection in accordance with CSA, NIOSH, U.S. EPA and manufacturer's requirements.

1.22.5 Provide all workers and up to five (5) visitors to the site with proper hearing protection. Workers and visitors shall not be exposed to noise levels greater than 85 dB (A) over an eight hour shift without proper hearing protection, in accordance with the Hearing Conservation Program.

1.22.6 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.

1.22.7 Provide workers and up to five (5) visitors to the site with CSA approved hard hats meeting the CSA Z94.1.

1.22.8 Provide high visibility apparel as defined in Occupational Health and Safety Regulations.

1.22.9 Provide CSA approved safety boots meeting CSA Z195.

1.22.10 Provide other personal protective equipment, as may be required by the owner, depending on duties being performed.

1.23 CONFINED SPACE WORK

1.23.1 Comply with the Ontario Occupational Health and Safety Regulations.

1.23.2 Ensure a hazard assessment has been conducted related to the confined space and the work to be performed within the space.

1.23.3 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.

1.23.4 Ensure all required PPE is provided to the workers and workers are trained in its use, care and selection.

1.23.5 Develop a confined space entry (CSE) program specific to the nature of work performed and in accordance with OHS Act and Regulations and ensure supervisors and workers are trained in the confined space entry program. This shall include training on the CSE permit system, rescue plan, testing, communication equipment and all equipment and safe work procedures conducted in and around the confined space.

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

1.23.6 Provide and maintain training of workers through a provider certified by the Workplace NL.

1.23.7 Provide Owner with a copy of an "Entry Permit" for each entry into the confined space to ensure compliance Provincial Legislation.

1.24 HAZARDOUS MATERIALS

1.24.1 Should material resembling hazardous materials (e.g. asbestos/mould) not previously identified/documented be encountered during the execution of work, stop work and notify Owner. Do not proceed until written instructions have been received from Owner.

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

1.25 HEAVY EQUIPMENT

1.25.1 Ensure mobile equipment used on jobsite is of the type specified in OHS Act and Regulations fitted with a Roll Over Protective (ROP) Structure and Falling Object Protective (FOP) Structure.

1.25.2 Ensure that operators of mobile equipment have adequate instruction and are competent in the operation of mobile equipment.

1.25.3 Provide certificate of training in Power Line Hazards for operators of heavy equipment.

1.25.4 Obtain written clearance from the power utility where equipment is used in close proximity to (within 5.5 metres) overhead or underground power lines.

1.25.5 Equip cranes with:

.1 A mechanism which will effectively prevent the hook assembly from running into the top boom pulley.

.2 A legible load chart.

.3 A maintenance log book.

1.26 WORKPLACE VIOLENCE AND HARASSMENT

1.26.1 Develop a Workplace Violence and Harassment Prevention Plan for the project that complies with the latest edition of the OHS Regulations.

1.27 ACCESS, EGRESS AND WALKWAYS

1.27.1 Ensure that all accesses, egresses and walkways are continuously monitored for hazards which may include slips, trips, slippery conditions and other hazards.

1.27.2 Develop provisions for snow clearing of walkways, accesses and egresses.

1.27.3 Ensure that all access, egress hatches, holes or other potential hazards of this nature are clearly identified to workers and adequately covered.

1.28 RIGGING AND SLINGING

1.28.1 Ensure that workers required to perform work related to rigging and slinging are trained and deemed competent in such operations and practices.

1.28.2 Maintain and inspect all rigging and slinging equipment in accordance with manufacturers' specifications, CSA Standards and OHS Regulations.

1.28.3 Ensure that the working load limit of rigging and slinging equipment on site is marked and visible on the product.

1.28.4 At a minimum, ensure that rigging and slinging operations meet the requirements of the OHS Act and Regulations.

1.28.5 Ensure that rigging and slinging equipment identified in daily inspections or otherwise identified as damaged, worn or unacceptable to manufacturers' specifications, appropriate standards or OHS Regulations is immediately taken out of service and destroyed.

1.29 WORK STOPPAGE

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

1.30 OWNER'S STATEMENT

1.30.1 The Owner shall not be responsible for injury or damage occasioned by a failure of the Contractor to adhere to the provisions of this Section.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE

END OF SECTION

1 GENERAL

1.1 FIRES

1.1.1 Fires and burning of rubbish on site not permitted.

1.2 DISPOSAL OF WASTES

1.2.1 Do not bury rubbish and waste materials on site.

1.2.2 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

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

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

1.3.3 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

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

1.4.2 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.

1.4.3 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.

1.4.4 Minimize stripping of topsoil and vegetation.

1.4.5 Restrict tree removal to areas indicated or designated by Owner's Representative.

1.5 WORK ADJACENT TO WATERWAYS

1.5.1 Do not operate construction equipment in waterways.

1.5.2 Do not use waterway beds for borrow material.

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

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

1.5.5 Do not skid logs or construction materials across waterways.

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

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

1.6 POLLUTION CONTROL

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

1.6.2 Control emissions from equipment and plant to local authority's emission requirements.

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

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

1.7 NOTIFICATION

1.7.1 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.

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

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

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 SUMMARY

1.1.1 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.

1.1.2 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

1.2.1 Division 1 – General Requirements.

1.3 REFERENCES

1.3.1 Canadian General Standards Board (CGSB)

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

1.3.2 Canadian Standards Association (CSA)

.1 CAN/CSA Z317.13-F07, Infection Control During Construction, Renovation and Maintenance of Health Care Facilities.

2 PRODUCTS

2.1 MATERIALS

2.1.1 Provide polyethylene sheet with flame-spread rating of no more than 25 and smoke developed classification of no more than 50. Provide structures for stand-alone barriers as required to support dust barriers.

3 EXECUTION

3.1 PRE-WORK ACTIVITIES

3.1.1 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

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

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

3.2.3 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.

3.2.4 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.)

3.2.5 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.

3.2.6 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

3.3.1 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.

3.3.2 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).

3.3.3 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.

.4 Work within sensitive occupied areas such as data centres and laboratories.

.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

1 GENERAL

1.1 REFERENCES AND CODES

1.1.1 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.

1.1.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

1.2.1 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.

1.2.2 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

1.3.1 Comply with smoking restrictions.

1.4 RELICS AND ANTIQUITIES

1.4.1 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.

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

1.4.3 Relics, antiquities and items of historical or scientific interest remain Her Majesty's property.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION

3.1 PERMITS, APPROVALS & FEES

3.1.1 Obtain and pay for all required permits, approvals and fees from all authorities having jurisdiction. These shall include, but will not be limited to:

.1 Permitting:
  .1 To construct/demolish/renovate
  .2 HVAC
  .3 Plumbing & Drainage
  .4 Fire & Life Safety
  .5 Road closure
  .6 Noise exemption permits
  .7 Fire hydrant flow test
  .8 Fire hydrant use
  .9 Sewer Discharge
.2 Safety Inspections and Approvals:
  .1 TSSA
  .2 ESA
  .3 Ministry of Environment
.3 Waste disposal, recycling & management

END OF SECTION

1 GENERAL

1.1 RELATED DOCUMENTS

1.1.1 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

1.2.1 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.

1.2.2 All construction industry standards referenced in this specification to meet the edition of the standard referenced by the National Building Code of Canada (NBC) or Local Provincial Code (whichever Code is Applicable based on jurisdiction). If the construction industry standard in not referenced in the Applicable Code, the latest edition of the standard shall apply.

1.2.3 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

1.3.1 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.

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

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

.7 American Bearing Manufacturers Association (ABMA).

.8 American Boiler Manufacturer's Association (ABMA).

.9 American Concrete Institute (ACI).

.10 American Industrial Hygiene Association (AIHA).

.11 American Institute of Steel Construction (AISC).

.12 American Iron & Steel Institute (AISI).

.13 American National Standards Institute (ANSI).

.14 American Petroleum Institute (API).

.15 American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).

.16 American Society of Mechanical Engineers (ASME).

.17 American Society of Sanitary Engineer’s (ASSE).

.18 American Society for Testing and Materials (ASTM).

.19 American Water Works Association (AWWA).

.20 American Welding Society (AWS).

.21 Associated Air Balance Council (AABC).

.22 Association of the Wall and Ceilings Industries International (AWEI).

.23 Building Industry Consulting Services International (BICSI).

.24 Canada Green Building Council (CaGCB).

.25 Canadian Council of Ministers of the Environment (CCME).

.26 Canadian Construction Materials Centre (CCMC).

.27 Canadian Environmental Protection Act (CEPA).

.28 Canadian Gas Association (CGA).

.29 Canadian General Standards Board (CGSB).

.30 Canadian Institute of Steel Construction (CISC).

.31 Canadian Paint Manufacturer’s Association (CPMA).

.32 Canadian Roofing Contractors' Association (CRCA).

.33 Canadian Sheet Steel Building Institute (CSSBI).

.34 Canadian Standards Association (CSA).

.35 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA).

.36 Canadian Urethane Foam Contractors' Association Inc. (CUFCA).

.37 Consumer Electronics Association (CEA).

.38 Cooling Technology Institute (CTI).

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

.40 Electronic Industries Alliance (EIA).

.41 Environment Canada (EC).

.42 Environmental Protection Agency (EPA).

.43 Environmental Protection Services (EPS).

.44 ETL Listing Laboratories (ETL).

.45 Factory Mutual (FM).

.46 Federal Communications Commission (FCC).

.47 Health Canada - Workplace Hazardous Materials Information System (WHMIS).
.48 Hydraulics Institute (HI).
.49 Hydronic Institute of Boiler and Radiator Manufacturers (IBR).
.50 Industry Canada - Terminal Attachment Program.
.51 Institute of Electrical and Electronics Engineers (IEEE).
.52 Institute for Research in Construction (IRC).
.53 Insulated Cable Engineers Association (ICEA).
.54 International ElectroTechnical Commission (IEC).
.55 International Standards Organization (ISO).
.56 Laminators Safety Glass Association (LSGA).
.57 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
.58 National Energy Code of Canada for Buildings (NECB).
.59 National Association of Corrosion Engineers (NACE).
.60 National Building Code of Canada (NBC).
.61 National Bureau of Standards/Products Standard (NBS/PS).
.62 National Electrical Manufacturers Association (NEMA).
.63 National Environmental Balancing Bureau (NEBB).
.64 National Fire Code of Canada (NFC).
.65 National Fire Protection Association (NFPA).
.66 National Fireproofing Contractors Association (NFCA).
.67 National Plumbing Code of Canada (NPC).
.68 National Research Council Canada (NRC).
.69 National Roofing Contractors Association (NRCA).
.70 National Sanitation Foundation (NSF).
.71 Plumbing and Drainage Institute (PDI).
.72 Provincial Boiler, Pressure Vessel and Compressed Gas Regulations.
.73 Sealant and Waterproofer’s Institute.
.74 Sheet Metal and Air Conditioning Contractors’ National Association (SMACNA).
.75 Society of Automotive Engineers (SAE).
.76 The Society for Protective Coatings (SSPC).
.77 Telecommunications Distribution Methods Manual (TDMM).
.78 Telecommunications Industries Association (TIA).
.79 Thermal Insulation Association of Canada (TIAC).
.80 Transport Canada (TC).
.81 Treasury Board of Canada (TB).
.82 Treasury Board Information Technology Standard (TBITS).
.83 Underwriters' Laboratories Inc. (UL).

.84 Underwriter's Laboratories of Canada (ULC).

.85 United States Federal Trade Commission (US Federal Trade Commission).

.86 U.S. Department of Transportation (DOT).

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 SECTIONS INCLUDE

1.1.1 Inspection and testing, administrative and enforcement requirements.

1.1.2 Tests and mix designs.

1.1.3 Mock-ups.

1.1.4 Mill tests.

1.1.5 Equipment and system adjust and balance.

1.2 RELATED SECTIONS

1.2.1 Section 01 21 00 – Allowances.

1.2.2 Section 01 33 00 – Submittal Procedures

1.2.3 Section 01 78 00 – Closeout Submittals

1.3 INSPECTION

1.3.1 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.

1.3.2 Give 48 hours notice requesting inspection if Work is designated for special tests, inspections or approvals by Owner's Representative instructions.

1.3.3 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.

1.3.4 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 INDEPENDENT INSPECTION AGENCIES

1.4.1 Independent Inspection/Testing Agencies will be engaged by Owner's Representative for purpose of inspecting and/or testing portions of Work.

1.4.2 Allocated costs: refer to Supplementary Bid Form to review if the cost of any testing requirements are to carried within a Cash Allowance.

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

1.4.4 The Owner's Employment of Independent inspection/testing agencies does not relax the responsibility to perform Work in accordance with Contract Documents; nor does it eliminate the need for this Contractor to be responsible and pay for all other inspection and testing requirements indicated within the Contract Documents.

1.4.5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Owner's Representative at no cost to Owner's Representative. Pay costs for retesting and reinspection.

1.5 ACCESS TO WORK

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

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

1.6 PROCEDURES

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

1.6.2 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.

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

1.7 REJECTED WORK

1.7.1 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.

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

1.7.3 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.

1.8 REPORTS

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

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

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

1.9 MOCK-UPS

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

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

1.9.3 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.

1.9.4 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.

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

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

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

1.9.8 Mock-ups may remain as part of Work.

1.10 FIRE SEPARATIONS

1.10.1 Provide fire separation labelling/stenciling to match base building standards.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 SECTION INCLUDES

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

1.1.2 Manufacturer's instructions.

1.1.3 Quality of Work, coordination and fastenings.

1.2 RELATED SECTIONS

1.2.1 Section 01 45 00 – Quality Control.

1.2.2 Section 01 73 00 – Execution.

1.3 REFERENCES

1.3.1 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.

1.3.2 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 TRANSPORTATION

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

1.5 QUALITY OF WORK

1.5.1 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.

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

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

1.6 CO-ORDINATION

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

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

1.6.3 Provide co-coordination drawings that encompass the work of all sub-trades to ensure that the work can be carried out as intended and without conflict. Notify the Engineer of any potential conflict and do not proceed with the installation of the work that may have such conflict.

1.7 CONCEALMENT

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

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

1.8 REMEDIAL WORK

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

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

1.9 PROTECTION OF WORK IN PROGRESS

1.9.1 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.

1.10 EXISTING UTILITIES

1.10.1 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.

1.10.2 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.

1.10.3 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.

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

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

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Requirements and limitations for cutting and patching the Work.

1.2 RELATED SECTIONS

1.2.1 Section 01 11 00 - Summary of Work.

1.2.2 Section 01 33 00 - Submittal Procedures.

1.3 SUBMITTALS

1.3.1 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.

1.3.2 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

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

1.4.2 After uncovering, inspect conditions affecting performance of Work.

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

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

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

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

1.5 EXECUTION

1.5.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.

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

1.5.3 Uncover Work to install ill-timed Work.

1.5.4 Remove and replace defective and non-conforming Work.

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

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

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

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

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

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

1.5.11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 - Firestopping, full thickness of the construction element.

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

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

1.5.14 Make cuts with clean, true, smooth edges.

1.5.15 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

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

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 GENERAL

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

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

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

1.2 RELATED SECTION

1.2.1 Section 01 77 00 - Closeout Procedures.

1.3 PROJECT CLEANLINESS

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

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

1.3.3 Clear snow and ice directly from the work area and the access to the work area. Coordinate the snow removal requirements of the facility with the Owner. The intent of this contract is not to replace the efforts or scope of the Owner's existing snow removal contract.

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

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

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

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

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

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

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

1.3.11 Provide and use marked separate bins for recycling.

1.4 FINAL CLEANING

1.4.1 Refer to General Conditions.

1.4.2 The list below covers many potential eventualities that may occur in the final cleaning process of a project. All requirement listed below that are directly impacted by the scope of work of this project shall be fulfilled.

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

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

1.4.5 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.

1.4.6 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.

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

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

1.4.9 Clean and polish mechanical and electrical fixtures. Replace broken, scratched or disfigured items.

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

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

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

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

1.4.14 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

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

1.4.16 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

1.4.17 Remove dirt and other disfiguration from exterior surfaces.

1.4.18 Clean roofs, gutters, downspouts and drainage systems. Clean areaways and sunken wells.

1.4.19 Sweep and wash clean paved areas.

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

1.4.21 Remove snow and ice from access to building.

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

1.5 WASTE MANAGEMENT AND DISPOSAL

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

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 SECTION INCLUDES

1.1.1 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

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

1.2.2 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.

1.2.3 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.

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

1.2.5 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.

1.2.6 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.

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

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

1.2.9 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)

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

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

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

1.3.4 Provide containers to deposit reusable and recyclable materials.

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

1.3.6 Locate separated materials in areas which minimize material damage.

1.3.7 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

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

1.4.2 Protect, stockpile, store and catalogue salvaged items.

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

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

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

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

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

1.4.8 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

1.5.1 Do not bury rubbish or waste materials.

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

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

1.5.4 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

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

1.6.2 Provide security measures approved by Owner's Representative.

1.7 SCHEDULING

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

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION

3.1 APPLICATION

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

3.2 CLEANING

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

3.2.2 Clean-up work area as work progresses.

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

3.3 DIVERSION OF MATERIALS

3.3.1 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.

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

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

1.1.1 Section 01 74 00 - Cleaning.

1.1.2 Section 01 78 00 - Closeout Submittals.

1.2 FINAL INSPECTION AND DECLARATION PROCEDURES

1.2.1 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.

1.2.2 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.

1.2.3 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 Certificates required by Fire Commissioner, Utility companies have been submitted.

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

.6 Work is complete and ready for Final Inspection.

1.2.4 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.

1.2.5 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.

1.2.6 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.

1.2.7 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

1.3.1 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.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 SECTION INCLUDES

1.1.1 As-built, samples, and specifications.

1.1.2 Equipment and systems.

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

1.1.4 Operation and maintenance data.

1.1.5 Spare parts, special tools and maintenance materials.

1.1.6 Warranties and bonds.

1.1.7 Final site survey.

1.2 RELATED SECTIONS

1.2.1 Section 01 33 00 – Submittal Procedures.

1.2.2 Section 01 45 00 – Quality Control.

1.2.3 Section 01 77 00 - Closeout Procedures.

1.3 SUBMISSION

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

1.3.2 Submit one PDF copy of the completed volumes in final form 15 days following Substantial Performance of the Work. The PDF file shall be fully indexed.

1.3.3 The Copy will be returned with the Owner's Representative's comments prior to Total Completion of the Work.

1.3.4 Revise content of documents per the Owner's Representative's comments within 15 Days of receiving the comments to create the Final Submittal.

1.3.5 Submit the Final Submittal, in PDF format, to the Owner's Representative for final review by the Owner's Representative. Once the Final Submittal approved, submit the Final Submittal in PDF format along with two final hard copies of the operating and maintenance manuals.

1.3.6 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.

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

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

1.3.9 Pay costs of transportation.

1.4 FORMAT

1.4.1 Organize data in the form of an instructional manual.

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

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

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

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

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

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

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

1.4.9 Provide CAD files in DWG format on a USB. Also provide electronic files in PDF format.

1.5 CONTENTS - EACH VOLUME

1.5.1 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.

1.5.2 For each product or system:

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

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

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

1.5.5 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.

1.6 AS-BUILTS AND SAMPLES

1.6.1 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.

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

1.6.3 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.

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

1.6.5 Keep record documents and samples available for inspection by Owner’s Representative.

1.7 RECORDING ACTUAL SITE CONDITIONS

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

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

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

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

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

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

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

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

1.7.5 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.

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

1.7.7 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 MATERIALS AND FINISHES

1.8.1 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.

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

1.8.3 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.

1.8.4 Additional Requirements: as specified in individual specifications sections.

1.9 MAINTENANCE MATERIALS

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

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

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

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

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

1.10 SPECIAL TOOLS

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

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

1.10.3 Deliver to project site place and store.

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

1.11 STORAGE, HANDLING AND PROTECTION

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

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

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

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

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

1.12 WARRANTIES AND BONDS

1.12.1 Develop warranty management plan to contain information relevant to Warranties.

1.12.2 Submit warranty management plan to Owner's Representative's approval.

1.12.3 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.

1.12.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

1.12.5 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:

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

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

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

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

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

.6 Co-execute submittals when required.

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

1.12.6 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.

.2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems, lightning protection systems.

.3 Provide list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.4 Procedure and status of tagging of equipment covered by extended warranties.

.5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.12.7 Respond in a timely manner to oral or written notification of required construction warranty repair work.

1.12.8 Written verification will follow oral instructions. Failure to respond will be cause for the Owner's Representative to proceed with action against Contractor.

1.13 PRE-WARRANTY CONFERENCE

1.13.1 Meet with Owner's Representative to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Owner's Representative.

1.13.2 Owner’s Representative will establish communication procedures for:

.1 Notification of construction warranty defects.

.2 Determine priorities for type of defect.

.3 Determine reasonable time for response.

1.14 WARRANTY TAGS

1.14.1 Tag, at time of installation, each warranted item. Provide durable, oil and water-resistant tag approved by Owner’s Representative.

1.14.2 Leave date of acceptance until project is accepted for occupancy.

1.14.3 Indicate following information on tag:

.1 Type of product/material.

.2 Model number.

.3 Serial number.

.4 Contract number.

.5 Warranty period.

.6 Inspector's signature.

.7 Construction Contractor.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

1.1.1 Division 1

1.1.2 'Mechanical Divisions'

.1 Division 21

.2 Division 22

.3 Division 23

1.2 GENERAL

1.2.1 This section of the specification is an integral part of the Contract Documents and shall be read accordingly.

1.2.2 The General Conditions of the Contract, the Supplementary Conditions and all Sections of Division 1 - General Requirements shall be deemed to apply and be a part of this section of the specification as fully as if recited in full herein.

1.2.3 Definition

.1 Mechanical Contractor: The term "Mechanical Contractor" is used within this specification when referring to the Division 21, 22 and 23 Contractor.

1.2.4 This Section is specific to the aforementioned Mechanical Divisions and is relevant and applicable in all cases.

1.2.5 All bidders with relevant work under these Mechanical Divisions shall include for all labour, material, equipment and any other related costs to provide a complete and fully operational mechanical system as described and visually represented in the mechanical drawings and Mechanical Division Specifications.

1.2.6 In the event of any doubt from the Mechanical Contractor or their sub-contractors, the consultant must be contacted via written documentation for clarification of doubt. Misinterpretation of Mechanical Division drawings or specifications does not relieve the Mechanical Contractor or their sub-contractors from the responsibility of providing a complete and fully operational mechanical system.

1.2.7 The Mechanical Contractor must examine the site and the local conditions that may affect the work prior to the start of work. All other Division drawings and specifications must be reviewed and understood prior to the commencement of work. If any discrepancies are noted, the Mechanical Contractor must promptly notify the Consultant. No allowance will be made later for any expenses incurred through the failure to make examinations or to report any such discrepancies in writing to the Consultant.

1.2.8 Mechanical Contractor shall provide all tools, scaffolding, materials and storage, site office, etc. as required to complete the work.

1.3 CODES, PERMITS AND FEES

1.3.1 All work shall conform with Federal, Provincial and Local Regulations.

1.3.2 Any ESA, TSSA and/or other Authorities having jurisdiction's permit fees associated with the Mechanical Divisional work shall be payed for by the Mechanical Contractor.

1.3.3 Any equipment that does not bear the required UL/ULC, CSA and/or CETL label will be required to be certified on site by an appropriate 3rd party certification agency. The Mechanical Contractor shall pay for all associated costs of certification.

1.3.4 Provide all inspection and certificates at the completion of work to signify that all work is compliant with the laws and regulations of Authorities having jurisdiction.

1.4 RELEVANT DIVISION REFERENCES

1.4.1 The following table is provided to assist the Mechanical Contractor in referencing other Divisions that are relevant and applicable to the Mechanical Divisions.

Section Number	Section Title
N/A	Amendments to CCDC 2 - 2008
Section 01 11 00	"Summary of Work"
Section 01 14 00	"Work Restrictions"
Section 01 31 00	"Project Management and Coordination"
Section 01 32 00	"Construction Progress Documentation"
Section 01 33 00	"Submittal Procedures"
Section 01 35 29.06	"Health and Safety Requirements"
Section 01 35 43	"Environmental Procedures"
Section 01 35 99	"Dust Control Procedures"
Section 01 41 00	"Regulatory Requirements"
Section 01 42 00	"References"
Section 01 45 00	"Quality Control"
Section 01 61 00	"Common Product Requirements"
Section 01 73 00	"Execution"
Section 01 74 00	"Cleaning"
Section 01 74 21	"Construction Demolition/Waste Management"
Section 01 77 00	"Close Out Procedures"
Section 01 78 00	"Close Out Submittals"
Section 22 11 17	"Domestic Water Piping – Copper"
Section 23 07 19	"Piping Insulation"
Section 23 21 14	"Hydronic Systems Piping and Valves"

1.5 CONTRACT AGREEMENT AND UNDERSTANDING

1.5.1 The mechanical drawings and specifications are specific to the aforementioned Mechanical Divisions. Drawings do not show or explain any architectural or structural details, and any specifications involving installation, measurement, material or equipment. Architectural and structural information shall be extracted from their respective Divisional drawings and specifications. Any necessary changes to physical runs of piping, ductwork, tubing, etc. shall be completed to adhere to the aforementioned drawings and specifications.

1.5.2 Structural, Architectural and Electrical drawings and specifications may provide information relevant to the Mechanical Divisions and should be used in conjunction with the mechanical drawings and specifications.

1.5.3 The relocation of any equipment may be done so at no additional charge pending the relocation is altered prior to installation and does not necessitate major additional material and/or labour.

1.5.4 In some cases, there may be differences that occur between floor plans and riser diagrams or schematics and drawings. The Mechanical Contractor shall base their bids on whichever indicates the greater cost.

1.5.5 The Mechanical Contractor must provide field verification and measurements with respect to drawings. Prior to the commencement of any work, the contractor must verify all grade and invert elevations, levels, and dimensions to ensure proper and precise installation. Work completed without field verification is subject to alleviation under the direction of the Consultant at no cost to the Owner.

1.5.6 Any discrepancies found on drawings and/or specifications that differ between drawings or actual field conditions must be brought to the attention of the Consultant immediately for instruction.

1.5.7 All equipment, piping, ductwork, etc. shall be installed in a manner that provide ample service clearances and access. Any interferences with other equipment or material is not acceptable. Access doors shall be provided for all concealed operable mechanical equipment. In the case where the Mechanical Contractor does not abide to these statements, they shall alleviate the issues under the direction of the Consultant at no cost to the Owner.

1.5.8 Further to the work specifically mentioned in the Mechanical Division drawings and specifications, the Mechanical Contractor shall provide all other items, components, service space, etc. that are obviously necessary to complete the installation of work.

1.5.9 If Mechanical Division drawings and/specifications do not provide mounting heights and exact locations of wall mounted equipment, the Mechanical Contractor must obtain approval from the Consultant prior to installation.

1.5.10 The approximate location of terminal devices such as thermostats, humidistats, plumbing fixtures, sprinkler heads, grilles and diffusers etc. located within the finished space are shown on the mechanical drawings. The dimensioned location for these devices is to be obtained from the Architectural drawings. Where these devices are not dimensioned on the Architectural drawings, request the final elevation and location from the Consultants prior to installation. Locate the devices within 1.5 metres of the position shown on the Mechanical Drawings at no cost to the Owner.

1.6 PROGRESS PAYMENTS

1.6.1 The Mechanical Contractor shall submit requests for payment in accordance with Table 1.6.1.

1.6.2 The Mechanical Contractor shall breakdown payment progress draws into identifiable line items as requested by the Mechanical Consultant or Owner. If the Owner does not provide a detailed breakdown list of line items, the contractor can assume the following categories as a rubric:

Line Item	Itemized Description	Sub-Section Breakdowns
Mobilization		
Project Management		
Shop Drawings		
As Built Documentation and Manuals		
Commissioning		
Plumbing and Drainage	Each System (i.e. Sanitary, Storm, Natural Gas, etc.)	- Material - Labour
	Equipment (i.e. Plumbing Fixtures, Valves, Sump Pumps, etc.)	- Material - Labour
HVAC	Each System (i.e. HVAC Piping, Sheet Metal, etc.)	- Material - Labour
	Equipment (i.e. Pumps, Air Handling Units, Split Systems, Fan Coil Units, etc.)	- Material - Labour - Start-Up
Controls	Building Automation System Wiring and Conduit	- Material - Labour
	Equipment (Control Panels, Sensors, Integrators, Etc.)	- Material - Labour
	Programming	- Labour

1.6.3 The Consultant shall review the monthly progress draw requests in accordance with the procedures identified in the contract documents.

1.7 FINAL PAYMENT

1.7.1 Final payment to the mechanical contractor will not be released until following test and certificates are submitted to the consultant:

1.7.2 Release of HVAC and P&D permit from the City where the building is being erected.

1.7.3 TSSA certificate/letter of final review and approval for high pressure steam., fuel oil installation, refrigeration piping etc.,

1.7.4 Test certificate approved by the City for all BFPA's installed in the building

1.7.5 Test certificate by the fire protection contractor signed and sealed by a professional engineer confirming design, construction and test in accordance and satisfaction to the City, NFPA 13 and Fire Department,

1.7.6 Video scope result of below grade piping,

1.7.7 Final as-built drawings (soft copy).

1.7.8 Confirmation by the client or minutes of meeting stating training /demonstration sessions have all been completed.

1.8 SUBMITTALS

1.8.1 Submittals: in accordance with Table 1.6.1.

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

1.8.3 Shop drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

1.8.4 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.

1.8.5 In addition to transmittal letter referred to in Table 1.6.1.: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.8.6 Closeout Submittals:

.1 Provide operation and maintenance data for incorporation into manual specified in Table 1.6.1.

.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 Engineer / Architect.

.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.

1.9 QUALITY ASSURANCE

1.9.1 Quality Assurance: in accordance with Table 1.6.1.

1.9.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Table 1.6.1.

1.10 MAINTENANCE

1.10.1 Furnish spare parts in accordance with Table 1.6.1. as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

1.10.2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Table 1.6.1.

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

1.10.4 Provide any and all additional equipment or components as identified in their respective Divisional specifications.

1.11 INSTALLATION OF WORK

1.11.1 It is the responsibility of the Mechanical Contractor to ensure that all Installation of Work is completed in a respectable and professional manner. The Mechanical Contractor shall be responsible for the following:

.1 The protection and maintenance of all work completed.

.2 The condition of all material and equipment.

.3 Workmanship.

.4 The protection of finished and unfinished work and equipment from other Divisions work. No damage due to other Divisions shall be acceptable.

.5 Coordinate all work with other Divisions.

.6 Prompt installation of work prior to concrete pouring or similar work (i.e. unground services and piping, etc.).

.7 Provide necessary temporary and/or future connections and rough-ins as required to allow for a streamlined work approach. Proceed with work as quickly as practical so that construction may be completed as swiftly as possible in accordance to the construction schedule (refer to table 1.6.1.).

.8 Ensure that all equipment and materials is delivered to site to accommodate the construction schedule (refer to Table 1.6.1.). If deliveries are on site prior to the possibility of installation or placement, all equipment and material must be securely and safely stored as to not be susceptible to exterior environmental extremities.

.9 All equipment shall be installed strictly as per manufacturer's instructions and recommendations unless otherwise noted by the Consultant.

1.12 INTERFERENCE DRAWINGS

1.12.1 The Mechanical Contractor shall provide information and locations for the preparation of interference drawings.

1.12.2 Interference drawings shall be prepared in ACAD 2018. If drawings are prepared in Revit, they must be regularly updated and provided to the Consultant for review.

1.12.3 Interference drawings shall be submitted to the Consultant for review in both hard copy (size to match indicated drawing size and scale) and electronic copy (i.e. PDF).

1.12.4 If specific congested areas require interference drawings, the Mechanical Contractor shall inquire with the Consultant on an appropriate drawing viewing scale (specifically for ACAD).

1.12.5 Interference drawings should always be provided in areas where there may be potential conflict of mechanical and electrical installation (i.e. piping, ductwork, cable trays, etc.).

1.12.6 All interference drawings must be coordinated with all other Divisions to ensure accuracy and acknowledgement. Any installation that must be modified to suit interference drawings shall be done so at no cost to the Owner.

1.12.7 Any installation that is completed without the use or submission of interreference drawings will be subjected to revision to adhere to interference requirements at no cost to the Owner.

1.12.8 The Mechanical Contactor must provide interference drawings for any alternative equipment that is approved by the Consultant and does not adhere to the original specified equipment dimensions.

1.12.9 Installation of work shall not commence until approval of interference drawings is completed by the Consultant.

1.12.10 In the event that there is interferences between multiple Divisions, an on site work meeting shall be organized by the Mechanical Contractor for prompt remedial action to take place.

1.13 MATERIALS

1.13.1 All materials shall be in accordance with the Mechanical Division drawings and specifications. In the event that the Mechanical Contractor wishes to provide an alternative, equivalent and/or substitute, the following criteria must be followed:

.1 The Mechanical Contractor shall provide itemized cost savings.

.2 The Consultant has the ability to reject submissions and request samples from the Mechanical Contractor.

.3 The Mechanical Contractor must bear any and all additional costs associated with requirement of 3rd party certified testing agencies to evaluate the quality of materials and equipment to be installed.

1.13.2 The basis of bid is based on manufacturer, brand name, performance, type and/or serial number provided in the Mechanical Division drawings and specifications. Materials and equipment specified shall be used as part of this work, unless mutual acceptance is provided in writing between the Mechanical Contractor and the Consultant.

1.14 SHOP DRAWINGS

1.14.1 The Mechanical Contractor must submit detailed performance, dimensional and installation piping and wiring diagrams for the mechanical equipment part of this work.

1.14.2 All shop drawing documentation shall be sent in electronic format (i.e. PDF). Each submission shall include a front-page transmittal indicating date of submission, Mechanical Contractor information, project title and address, Owner and Consultants project number, project managers names and titles (both Owner and Consultant) and review stamp by Mechanical Contractor.

1.14.3 The Consultant shall provide a stamped electronic copy of the shop drawing documents. It is the Mechanical Contractors responsibility to review comments and resubmit shop drawings as required.

1.14.4 The Mechanical Contractor shall ensure that a minimum of one (1) hard copy of each reviewed shop drawing is provided on site for reference.

1.15 CONSULTANT'S INSTRUCTIONS

1.15.1 At any given time during the course of construction, the Consultant may provide instructions as deemed necessary for verification and/or correction to the work. All instruction shall be provided in written documentation and shall effectively become a binding agreement as part of the drawings and/or specifications.

1.16 WARRANTY

1.16.1 All work and installed equipment shall be provided with a warranty against all defects of workmanship and material for a period of one (1) year after the substantial completion date of the work. The substantial completion date must be documented in written format.

1.16.2 Equipment warranties are indicated in their respective Divisional specification sections.

1.17 EQUIPMENT

1.17.1 All equipment shall be installed in such a way to permit accessibility for maintenance.

1.17.2 All equipment shall be installed with unions, flanges or other means to allow for ease of replacement and to minimize disturbance to mechanical systems.

1.17.3 All equipment shall be installed as to not interfere with building structure or other mechanical equipment.

1.17.4 All equipment drain ports must be piped to nearest floor drain. For glycol systems, pipe to nearest glycol feeder tank. In no case will drain ports not piped to a drain be accepted.

1.17.5 All equipment must be installed with the proper support (i.e. saddles, platforms, hangers, etc.) as deemed necessary by Structural, Mechanical Division specifications and manufacturer's requirements.

1.18 REVIEW OF INSTALLATIONS

1.18.1 No workmanship and equipment that is to be concealed shall be insulated or finished without Consultant review and approval prior to completion. The Mechanical Contractor shall arrange for Consultant site visits based on the construction schedule and inform the Mechanical Consultant when tests are deemed to take place.

1.18.2 The Mechanical Contractor shall bear all costs associated with retesting and making good as deemed necessary by the Consultant due to failure of adhering to statement 1.19.1.

1.18.3 Prior to any testing of hydronic or air systems, the Mechanical Contractor shall isolate all equipment and any other systems that are not designed to withstand test pressures. The Mechanical Contractor must also ensure any capped ductwork or valves are rated at a 'dead end' operational pressure rating larger than test pressure.

1.19 PAINTING FOR MECHANICAL

1.19.1 All gas lines shall be painted in their entirety with a yellow exterior rated paint as per CSA B149. Any gas lines located within ceiling spaces above T-bar, drywall or similar partition materials shall be banded in accordance with Canadian Gas Authority requirements.

1.19.2 Provide flat black painting behind any grilles and diffusers.

1.19.3 During construction, the Mechanical Contractor must identify any and all scuffs and damages that must be repainted and touched up to match the original finish in quality and appearance. The Consultant may request the Mechanical Contractor "make-good" any areas which they deem unfit.

1.19.4 Apply a minimum of one (1) coat of corrosion resistant paint to supports, hangers and equipment fabricated of ferrous materials and subjected to oxidation.

1.20 FLASHING

1.20.1 The Mechanical Contractor shall coordinate all requirements for roofing, water-proofing and flashing with other Divisions.

1.20.2 All mechanical equipment and supports passing through or built into a roof shall be provided with flashing as directed by the roofing trade. All flashing must be installed to ensure a watertight seal.

1.20.3 Fit counter flashing over flashing or equipment curb. All counter flashing must be installed to ensure a watertight seal.

1.21 CUTTING AND PATCHING

1.21.1 Any cutting and patching work required for Mechanical Division equipment and material installation shall be done so after approval from the Architect. The Mechanical Contractor shall provide detailed location and dimensional drawings for approval prior to the commencement of any work.

1.21.2 All cutting and patching shall be governed by Division 1 and Architectural drawings and specification. In the case that there are no Architectural drawings and/or specifications provided, the Mechanical Contractor shall adhere to the following requirements:

.1 All cutting and patching work shall be completed by a specialized trade in the materials to be cut. Cutting and patching drawings or details shall be created by the Mechanical Contractor and submitted to the Consultant for review and approval prior to the commencement of work.

.2 In no case shall any load bearing or structural walls and supports be cut unless written acceptance is provided by a certified Structural Engineer.

.3 Any supporting membranes, walls or structure that is required to be cut must by approved by the Consultant prior to the commencement of work. The Mechanical Contractor shall provide detailed location and dimensional drawings to indicated cuts.

1.22 MECHANICAL AND ELECTRICAL COORDINATION

1.22.1 The following is a table of mechanical and electrical responsibilities for the work to be completed.

Item	Provided By	
	Mechanical (Divisions 21, 22, 23 and 25)	**Division 26**
Motor Control Centres, Switchboards, etc.		X
Remote Disconnect Switches complete with fuses when required		X
Motors	X	
Wiring and conduit for Voltages below 120 V	X	
Wiring and conduit for Voltages 120 V and above		X
Variable Frequency Drives	X	

1.22.3 All motor control centres, switchboards, motors at 120 V and above, etc., along with input and output power wiring will be by Division 26 unless Mechanical equipment is shipped to site as a packaged solution with a single power feed and includes internal transformers and starters. Refer to individual specification sections to identify equipment that is to be provided with single power feeds.

1.22.4 All starters shall be supplied by Mechanical Divisions. Installation and wiring of starters by Division 26 for any line and load side voltages of 120 V and above. Otherwise, by Mechanical Divisions.

1.22.5 Packaged equipment will have integral starters and only power feeders need be provided by Division 26.

1.22.6 Provide fire rated plywood backboards whenever communication equipment is to be wall mounted. Plywood is to be 21mm thick. Plywood to be either fire rated or with the appropriate label or coated with fire retardant paint.

1.22.7 If no wall location is suitable for mounting motor starters or VFD's, then mount the equipment on plywood backboard on Unistrut supports to meet the applicable code requirements for motor isolation switches.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION

3.1 CLEANING

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

3.2 FIELD QUALITY CONTROL

3.2.1 Site Tests: conduct following tests in accordance with Table 1.6.1. and submit report as described in SUBMITTALS.

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

3.2.2 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 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 QUALITY ASSURANCE.

3.3 PROTECTION

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

3.4 PIPEWORK INSTALLATION

3.4.1 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless otherwise indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves and for modulating control.

.6 Use ball or butterfly or gate valves at branch take-offs for isolating purposes except where otherwise specified.

.7 Install butterfly valves on chilled water, condenser water and low temperature heating systems only.

.8 Install butterfly valves between weld neck flanges to ensure full compression of liner.

.9 Use chain operators on valves NPS 2-1/2 and larger where installed more than 2400 mm above floor in Mechanical Rooms.

3.4.2 Check Valves:

.1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and elsewhere as indicated.

.2 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.

3.5 PREPARATION FOR FIRESTOPPING

3.5.1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00 - Firestopping.

3.5.2 Uninsulated unheated pipes not subject to movement: No special preparation.

3.5.3 Uninsulated heated pipes subject to movement: Wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation or install per manufacturer's recommendation as specified within the associated approval.

3.5.4 Insulated pipes and ducts: Ensure integrity of insulation and vapour barriers.

3.6 FLUSHING OUT OF PIPING SYSTEMS

3.6.1 In accordance with Section 23 08 16 - Cleaning and Start-up of Mechanical Piping Systems.

3.6.2 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 00 - Cleaning supplemented as specified in relevant sections of other Divisions.

3.6.3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.7 EXISTING SYSTEMS

3.7.1 Connect into existing piping systems at times approved by Owner's Representative. Work to be carried out off hours after 5 p.m., weekends or holidays.

3.7.2 Request written approval ten (10) working days minimum, prior to commencement of work.

3.7.3 Be responsible for damage to existing plant by this work.

3.7.4 Ensure daily clean-up of existing areas.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

1.1.1 Section 01 33 00 - Submittal Procedures.

1.1.2 Section 01 35 29.06 - Health and Safety Requirements.

1.1.3 Section 01 74 21 - Construction/Demolition Waste Management.

1.1.4 Section 01 78 00 - Closeout Submittals.

1.1.5 Section 21 05 00 - Common Work Results for Mechanical.

1.1.6 Section 23 07 19 – Piping Insulation.

1.2 REFERENCES

1.2.1 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.

.5 ASME B36.19M, Stainless Steel Pipe

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

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

1.2.3 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.

.5 ASTM A269/A269M, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.6 ASTM A403/A403M, Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings

.7 ASTM A351/A351M, Standard Specification for Casting, Austenitic, for Pressure Containing Parts.

.8 ASTM A182/A182M, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.

.9 ASTM A312/A312M, Seamless, Welded and Heavily Cold Worked Stainless Steel Pipes.

1.2.4 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.

.3 AWWA C228-08, Stainless-Steel Pipe Flanges For Water Service – Sizes 2 in. through 72 in. (50mm through 1800mm)

1.2.5 Canadian Standards Association (CSA International).

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

1.2.6 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA).

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

.1 Material Safety Data Sheets (MSDS).

1.2.8 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.

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

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

1.2.10 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA).

1.3 SUBMITTALS

1.3.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.3.2 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.

1.3.3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 62 00.01 - Hazardous Materials.

1.3.4 Closeout Submittals:

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

1.4 HEALTH AND SAFETY

1.4.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

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

1.5.3 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

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

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

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

2 PRODUCTS

2.1 PIPING

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

.1 Above ground:

.1 copper tube, hard drawn, type K: to ASTM B88M for each main riser.

.2 Stainless steel pipe shall be Type 304/304L or Type 316/316L and shall comply with ASTM A312/A312M and ASME B36.19M.

.3 Stainless steel tube shall be Type 304/304L or Type 316/316L and shall comply with ASTM A269 and ASME B16.19

.2 Above ground:

.1 copper tube, hard drawn, type L: to ASTM B88M for all other piping.

.2 Stainless steel pipe shall be Type 304/304L or Type 316/316L and shall comply with ASTM A312/A312M and ASME B36.19M.

.3 Stainless steel tube shall be Type 304/304L or Type 316/316L and shall comply with ASTM A269 and ASME B16.19

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

2.1.2 All piping shall have certification markings for compliance with ASTM B88.

2.1.3 When stainless steel piping is used the hanger or support if not stainless steel shall be suitably separated and electrically insulated from the pipe or tube.

2.2 FITTINGS

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

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

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

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

2.2.5 NPS 2 and larger:

.1 Copper: ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.

.2 304/304L or 316/316L Stainless Steel Butt Weld Pipe Fittings to:

.1 ASME B16.9 and ASTM A403/A403M

.2 Stainless Steel butt weld pipe fittings shall be made of a material that matches the grade of the pipe material used.

.3 Stainless Steel butt weld pipe fittings shall be at least as thick as the wall of the pipe used.

2.2.6 NPS 1 1/2 and smaller: wrought copper to ANSI/ASME B16.22, cast copper to ANSI/ASME B16.18; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa .

2.2.7 Grooved fittings, stainless steel, Type 304 Schedule 10, conforming to ASTM A403. Segmentally fabricated fittings shall not be allowed.

2.2.8 Mechanical grooved couplings, ductile iron, ASTM A536 (Grade 65-45-12) or malleable iron, ASTM A 47 (Grade 32510) housing, with EPDM gasket, steel track head bolts, ASTM A183, coated with copper coloured alkyd enamel.

2.3 JOINTS

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

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

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

2.3.4 Teflon tape: for threaded joints.

2.3.5 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.

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

2.3.7 304/304L or 316/316L Stainless Steel pipe flanges to:

.1 ASME B16.5

.2 ASTM A182/A182M

.3 AWWA C228

.4 Stainless steel pipe flanges shall be made of a material that matches the grade of the pipe material used.

2.4 GENERAL REQUIREMENTS FOR VALVES

2.4.1 All valves used in potable systems shall bear an NSF certification and adhere to the requirements of NSF/ANSI/CAN 61.

2.5 GLOBE VALVES

2.5.1 NPS 2 and under, balancing, soldered:

.1 To MSS SP 80, Class 125, 860 kPa, lead free bronze body, renewable composition disc, screwed over bonnet.

.2 Lockshield handles: as indicated.

.3 Standard of Acceptance: Jenkins, Crane, Toyo 212A-LF, Kitz 812, Grinnel.

2.5.2 NPS 2 and under, balancing, screwed:

.1 To MSS SP 80, class 125, 860 kPa, lead free bronze body, screwed over bonnet, renewable composition disc.

.2 Lockshield handles: as indicated.

.3 Jenkins, Crane, Toyo 211A-LF, Kitz 811, Grinnell.

2.6 SWING CHECK VALVES

2.6.1 NPS 2 and under, soldered:

.1 To MSS SP 80, class 125, 860 kPa, lead free bronze body, bronze swing disc, screw in cap, regrindable seat.

.2 Standard of Acceptance: Jenkins, Crane, Toyo 237A-LF, Kitz 823, Grinnell.

2.6.2 NPS 2 and under, screwed:

.1 To MSS SP 80, class 125, 860 kPa, lead free bronze body, bronze swing disc, screw in cap, regrindable seat.

.2 Jenkins, Crane, Toyo 236A-LF, Kitz 822, Grinnell.

2.6.3 NPS 2 1/2 and over, flanged:

.1 300 PSI, epoxy coated cast iron body, EPDM seat, bronze disc.

.2 Standard of Acceptance: Jenkins, Crane, Toyo 435, Kitz 78, Grinnell.

2.6.4 NPS 2 1/2 and over, flanged:

.1 Grade CF8M to ASME B16.34, class 125, 860 kPa, stainless steel body, FF flange, regrind renewable seat, stainless steel disc, bolted cap.

.2 Standard of Acceptance: Jenkins, Crane, Toyo, Kitz 150UOM, Grinnell.

2.7 BALL VALVES

2.7.1 NPS 3/4 to 2, branch isolators, screwed:

.1 600 WOG, lead free bronze body, solid chrome plated bronze ball, with Teflon seal.

.2 Ball valves shall have full port opening.

.3 Standard of Acceptance: Jenkins, Crane, Toyo 5044A-LF, Kitz 858, Grinnell, Apollo, Dahl, MAS B-1F-LF-SS.

2.7.2 NPS 1/2 and under, fixture isolators, screwed or solder:

.1 Lead free bronze body, solid chrome plated bronze ball.

.2 Quarter turn.

.3 Standard of Acceptance: Dahl

2.8 BUTTERFLY VALVES

2.8.1 NPS 2 1/2 and Over Full Lug Body (1380 kPa) to NSF 372 of 61:

.1 To be lug type, MSS SP 67, 1380 kPa WOG water, cast iron or ductile iron body with epoxy coated cast iron or aluminum bronze disc (nickel coated discs are not acceptable), 416 stainless steel stem, EPDM liner, with notched top plate and lever lock handle for valve sizes NPS 4 and smaller, and worm gear operator with hand wheel for valves NPS 6 and larger. Lugs shall be tapped. Valves to be bubble tight shutoff up to 1380 kPa rating if downstream equipment is removed. (full dead end service)

.2 Utilize for all on/off applications with operating pressures 1380 kPa and less.

.3 Operator

.1 NPS 6 and under: lever handle.

.1 Standard of Acceptance: Kitz 6122EL, Toyo 918BESL, MAS D Series

.2 NPS 8 and over: gear operated

.1 Standard of Acceptance Kitz 6141EG, Toyo 918BESG, MAS D Series

2.8.2 NPS 2 1/2 and Over Grooved End Pipe

.1 Grooved end butterfly valves shall have dual seal disc providing bubble tight service up to 2068 kPa. Ductile iron body conforming to ASTM A 536, Grade E EPDM disc coating. EPDM disc coating with stainless steel trim.

.2 Utilize for all on/off applications up to 1380 kPa operating pressure.

.3 Valves to be bubble tight shutoff up to 1380 kPa rating if downstream equipment is removed. (full dead end service)

.4 Operator

.1 NPS 6 and under: lever handle.

.2 NPS 8 and over: gear operated

.5 Standard of Acceptance: Victaulic Series 608, Grinnell, Mueller, Anvil, MA Stewart W50 Series

2.8.3 NPS 2 1/2 and Over Full Lug Body (1380 kPa) Stainless Steel.

.1 NSF/ANSI 372 compliant, lug type, MSS SP 67, 1380 kPa WOG water, cast iron or ductile iron body with 316 stainless steel disc, 416 stainless steel stem, EPDM liner, with notched top plate. Lugs shall be tapped. Valves to be bubble tight shutoff up to 1380 kPa rating if downstream equipment is removed. (full dead end service)

.2 Utilize for all on/off applications with operating pressures 1380 kPa and less.

.3 Operator

.1 NPS 6 and under: lever handle.

.1 Standard of Acceptance: Kitz 6141EL, Toyo, MAS D Series

.2 NPS 8 and over: gear operated

.1 Standard of Acceptance: Kitz 6141EG, Toyo, MAS D Series

2.9 WATER METER

2.9.1 The Water Meter shall be obtained from the local authority and installed by the Division 22 Contractor.

2.9.2 The Division 22 Contractor shall be responsible for the associated costs required to obtain the Water Meter from the local authority.

2.9.3 Meter shall be provided with the provision to tie into the Building Automation System.

3 EXECUTION

3.1 INSTALLATION

3.1.1 Install in accordance with Ontario Plumbing Code and local authority having jurisdiction.

3.1.2 Install pipe work in accordance with Section 23 05 05 – Installation of Pipework and by certified journeyperson supplemented as specified herein.

3.1.3 Assemble piping using fittings manufactured to ANSI standards.

3.1.4 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.

3.1.5 Install domestic cold water piping below and away from HWS and HWR and other hot piping so as to maintain temperature of cold water as low as possible.

3.1.6 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

3.1.7 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

3.2.1 Isolate equipment, fixtures and branches with butterfly or ball valves.

3.2.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.3 WATER METER

3.3.1 The products utilized to build the water meter assembly shall be in accordance with the Local Authorities requirements.

3.3.2 The Division 22 Contractor shall be responsible for reviewing the required installation detail provided by the Local Authority.

3.4 PRESSURE TESTS

3.4.1 Conform to requirements of Section 21 05 00 - Common Work Results for Mechanical.

3.4.2 Test pressure: greater of 1 ½ times maximum system operating pressure or 860 kPa.

3.5 FLUSHING AND CLEANING

3.5.1 New or repaired potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority having jurisdiction or in the absence of a prescribed method as follows:

.1 The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.

.2 The system or part thereof shall be filled with a water/chlorine solution containing at least 50 parts per million (50 mg/L) of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million (200mg/l) of chlorine and allowed to stand for three (3) hours.

.3 Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.

.4 The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

3.6 PRE-START-UP INSPECTIONS

3.6.1 Systems to be complete, prior to flushing, testing and start-up.

3.6.2 Verify that system can be completely drained.

3.6.3 Ensure that pressure booster systems are operating properly.

3.6.4 Ensure that air chambers, expansion compensators are installed properly.

3.7 START-UP

3.7.1 Timing: Start up after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Water treatment systems operational.

3.7.2 Provide continuous supervision during start-up.

3.7.3 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.

3.7.4 Rectify start-up deficiencies.

3.8 PERFORMANCE VERIFICATION

3.8.1 Timing:

.1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.

3.8.2 Procedures:

.1 Verify that flow rate and pressure meet Design Criteria.

.2 TAB HWR in accordance with Section 23 05 93 - Testing Adjusting and Balancing for HVAC.

.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.

3.8.3 Reports:

.1 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

END OF SECTION

1 GENERAL

1.1 SUMMARY

1.1.1 Section Includes:

.1 Thermal insulation for piping and piping accessories for the following systems:

.1 Condensate drain piping, indoors and outdoors.

.2 Chilled water piping, indoors and outdoors.

.3 Condenser water piping, indoors when used for water side

.4 Heating hot water piping, indoors and outdoors.

.5 Steam and steam condensate piping, indoors and outdoors.

.6 Refrigerant suction and hot gas piping, indoors and outdoors.

.7 Heat recovery piping, indoors and outdoors.

.8 Domestic water plumbing piping systems (potable and non-potable including grey water systems).

.9 Storm drainage piping systems.

1.2 RELATED SECTIONS

1.2.1 Section 01 33 00 – Submittal Procedures.

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

1.2.3 Section 07 92 00 – Joint Sealing.

1.2.4 Section 23 07 13 – Duct Insulation

1.2.5 Section 23 07 16 – HVAC Equipment Insulation.

1.2.6 Section 23 05 53.01 – Mechanical Identification.

1.3 REFERENCES

1.3.1 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).

1.3.2 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 Calcium 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.

1.3.3 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) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts

1.3.4 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.

1.3.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets.

1.3.6 Manufacturer's Trade Associations

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

1.3.7 Underwriters' Laboratories of Canada (ULC)

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

1.3.8 National Energy Code of Canada for Buildings (NECB).

1.4 DEFINITIONS

1.4.1 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.

1.5 SUBMITTALS

1.5.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

1.5.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. 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 Section 01 33 00 - Submittal Procedures.

1.5.3 Shop Drawings:

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

.2 Include plans, elevations, sections, details, and attachments to other work:

.1 Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.

.2 Detail attachment and covering of heat tracing inside insulation.

.3 Detail insulation application at pipe expansion joints for each type of insulation.

.4 Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.

.5 Detail removable insulation at piping specialties.

.6 Detail application of field-applied jackets.

.7 Detail application at linkages of control devices.

1.5.4 Samples:

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

.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.

1.5.5 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.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

1.6.1 Qualifications:

.1 Installer: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

1.6.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6.3 Surface Burning Characteristics:

.1 For insulation and related materials, UL/ULC Classified per UL 723 or meeting ASTM E 84, by a testing and inspecting agency acceptable to authorities; having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

.1 Insulation Installed Indoors: Flame spread index of 25 or less, and smoke developed index of 50 or less.

.2 Insulation Installed Outdoors: Flame spread index of 25 or less, and smoke developed index of 50 or less.

1.7 DELIVERY, STORAGE AND HANDLING

1.7.1 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 Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

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

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

1.7.2 Storage and Protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

1.7.3 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.

1.8 COORDINATION

1.8.1 Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."

1.8.2 Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8.3 Coordinate installation and testing of heat tracing.

1.9 SCHEDULING

1.9.1 Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

2 PRODUCTS

2.1 GENERAL

2.1.1 Products shall not contain formaldehyde, asbestos, lead, mercury, or mercury compounds.

2.1.2 Insulation materials applied to carbon steel shall be Mass Load Corrosion Rate (MLCR) tested per ASTM 1617.

2.1.3 Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

2.2 FIRE AND SMOKE RATING

2.2.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.3 INSULATION

2.3.1 **Type 1** – Preformed Pipe Insulation:

.1 Preformed insulation composed of high-quality glass fibers bonded together with a thermosetting resin with all service vapor retarder jacket (ASJ).

.2 Factory-applied pressure sensitive self-sealing lap closure system (SSL) with butt strips.

.3 Type I: 850 deg F (454 deg C) or Type IV: 1000 deg F (528 deg C).

.4 EPD Certified by UL Environment, UL/ULC Classified, FHC 25/50 per ASTM E 84.

.5 Comply with ASTM C 585, ASTM C 411, ASTM C795, and ASTM C 547, Type I or Type IV.

.6 Maximum "k" factor: 0.034 W/m C at 24 C (0.23 Btu in / (hr ft2 F) at 75 F) max to ASTM C518 and CAN/ULC S702.

.7 Insulation system shall be GREENGUARD GOLD Certified and have a Minimum total product recycled content of 28%.

.8 Standard of Acceptance: Manson Alley-K, Knauf, Johns Manville

2.3.2 **Type 3** – Flexible Elastomeric Thermal Insulation:

.1 Flexible elastomeric in tubular form

.2 Product shall meet the requirements defined in ASTM C534, Grade 1, Type I, Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in sheet and Tubular Form.

.3 Materials shall have a flame spread index of less than 25 and smoke developed index of less than 50 when tested in accordance with ASTM E84.

.4 Materials shall have a maximum thermal conductivity of 0.27 Btu x in. /h x sq. ft. x deg F (0.042 W/m x C) at 75F mean temperature when tested in accordance with ASTM C177 or ASTM C518.

.5 Adhesive shall be the insulation manufacturers recommended contact adhesive: Armaflex 520.

.6 Insulation finish shall be the insulation manufacturers recommended finish: WB Armaflex Finish.

.7 Standard of Acceptance: Armaflex, Johns Manville.

2.4 ADHESIVES

2.4.1 Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

2.4.2 Mineral Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

2.4.3 ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

.1 For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4.4 PVC Jacket Adhesive: Compatible with PVC jacket.

.1 For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 MASTICS

2.5.1 Materials shall be compatible with insulation materials, jackets, and substrates.

.1 For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5.2 Vapor Barrier Mastic: Water based; suitable for indoor use on below ambient services.

.1 Water Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.04 perm (0.026 metric perm) at 40 mil (1.016 mm) dry film thickness.

.2 Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).

.3 Solids Content: ASTM D 1644, 52 percent by volume and 62 percent by weight.

.4 Color: White.

2.5.3 Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

.1 Water Vapor Permeance: ASTM F 1249, 1.8 perm (1.2 metric perm) at 0.0625 inch (1.6 mm) dry film thickness.

.2 Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).

.3 Solids Content: 50 percent by volume and 58 percent by weight.

.4 Color: White.

2.6 LAGGING ADHESIVES

2.6.1 Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

2.6.2 For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6.3 Fire resistant, water-based lagging adhesive and coating for use indoors to adhere fire resistant lagging cloths over pipe insulation.

2.6.4 Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).

2.6.5 Color: White.

2.7 SEALANTS

2.7.1 Joint Sealants:

.1 Materials shall be compatible with insulation materials, jackets, and substrates.

.2 Permanently flexible, elastomeric sealant.

.3 Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).

.4 Color: White or gray.

.5 For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7.2 FSK and Metal Jacket Flashing Sealants:

.1 Materials shall be compatible with insulation materials, jackets, and substrates.

.2 Fire and water resistant, flexible, elastomeric sealant.

.3 Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).

.4 Color: Aluminum.

.5 For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7.3 ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

.1 Materials shall be compatible with insulation materials, jackets, and substrates.

.2 Fire and water resistant, flexible, elastomeric sealant.

.3 Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).

.4 Color: White.

.5 For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 FACTORY-APPLIED JACKETS

2.8.1 ASJ+ - SSL+; ASJ+ jacket with Self-Sealing Advanced Closure System; complying with ASTM C 1136 Type I, II, III, IV and VII secured with self-sealing longitudinal laps and matching ASJ+ butt strips.

2.8.2 All Service Jacket composed of aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C 1136 Type I, II, III, IV and VII.

2.8.3 ASJ: White, kraft paper, fiberglass reinforced scrim with aluminum foil backing; complying with ASTM C 1136, Type I.

2.8.4 ASJ-SSL: ASJ with self-sealing, pressure sensitive, acrylic based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.8.5 FSK Jacket: Aluminum foil, fiberglass reinforced scrim with kraft paper backing; complying with ASTM C 1136, Type II.

2.8.6 PSK Jacket: Aluminum foil, fiberglass reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

2.9 FIELD-APPLIED JACKETS

2.9.1 Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

2.9.2 FSK Jacket: Aluminum foil face, fiberglass reinforced scrim with kraft paper backing.

2.9.3 Woven Glass Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and pre-sized a minimum of 8 oz. /sq. yd. (271 g/sq. m).

2.9.4 Woven Glass Fiber Fabric: Approximately 2 oz. /sq. yd. (68 g/sq. m) with a thread count of 10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm) for covering pipe and pipe fittings.

2.9.5 Woven Polyester Fabric: Approximately 1 oz./sq. yd. (34 g/sq. m) with a thread count of 10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm), in a Leno weave, for pipe.

2.9.6 PVC Jacket: High impact resistant, UV resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

.1 Adhesive: As recommended by jacket material manufacturer.

.2 Color: White

2.9.7 Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

.1 Shapes: 45 and 90 degree, short and long radius elbows, tees, valves, flanges, unions, reducers, end caps, soil pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.9.8 Metal Jacket:

.1 Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.

.2 Factory cut and rolled to size.

.3 Finish and thickness are indicated in field-applied jacket schedules.

.4 Moisture Barrier for Outdoor Applications: 3 mil (0.075 mm) thick, heat bonded polyethylene and kraft paper

.5 Factory-Fabricated Fitting Covers:

.1 Same material, finish, and thickness as jacket.

.2 Preformed 2 piece or gore, 45 and 90 degree, short and long radius elbows.

.3 Tee covers.

.4 Flange and union cover.

.5 End caps.

.6 Beveled collars.

.7 Valve covers.

.8 Field-fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9.9 Stainless Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.

.1 cut and rolled to size.

.2 Material, finish, and thickness are indicated in field-applied jacket schedules.

.3 Moisture Barrier for Indoor Applications: 1mil (0.025 mm) thick, heat bonded polyethylene and kraft paper

.4 Moisture Barrier for Outdoor Applications: 3 mil (0.075 mm) thick, heat bonded polyethylene and kraft paper

.5 Factory-Fabricated Fitting Covers:

.1 Same material, finish, and thickness as jacket.

.2 Preformed 2 piece or gore, 45 and 90 degree, short and long radius elbows.

.3 Tee covers.

.4 Flange and union covers.

.5 End caps.

.6 Beveled collars.

.7 Valve covers.

.8 Field-fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.10 TAPES

2.10.1 ASJ Tape: White vapor retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

.1 Width: 3 inches (75 mm) or 4 inches (102 mm).

.2 Thickness Total: 14.3 mil (0.36 mm) for ASJ

.3 Adhesion: 90 ounces force/inch (1.0 N/mm) in width.

.4 Elongation: 2 percent.

.5 Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.

.6 ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.10.2 FSK Tape: Foil face, vapor retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

.1 Width: 3 inches (75 mm) or 4 inches (102 mm).

.2 Thickness Total: 13.3 mil (0.34 mm).

.3 Adhesion: 90 ounces force/inch (1.0 N/mm), in width.

.4 Elongation: 2 percent.

.5 Tensile Strength: 40 lbf/inch (7.2 N/mm), in width.

.6 FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.10.3 PVC Tape: White vapor retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

.1 Width: 2 inches (50 mm).

.2 Thickness: 6 mil (0.15 mm).

.3 Adhesion: 64 ounces force/inch (0.7 N/mm) in width.

.4 Elongation: 500 percent.

.5 Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

2.11 SECUREMENTS

2.11.1 Bands:

.1 Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch (0.38 mm) thick, 3/4 inch (19 mm) wide with wing seal or closed seal.

.2 Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

2.11.2 Staples: Outward clinching insulation staples, nominal ¾ inch (19 mm) wide, stainless steel or Monel.

2.11.3 Wire: 0.062 inch (1.6 mm) soft annealed, stainless steel

2.12 INSULATING CEMENTS

2.12.1 Mineral Fiber Insulating Cement: Comply with ASTM C 195.

2.12.2 Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

2.12.3 Mineral Fiber, Hydraulic Setting Insulating and Finishing Cement: Comply with ASTM C 449.

3 EXECUTION

3.1 MANUFACTURE'S INSTRUCTIONS

3.1.1 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

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

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

3.3 INSTALLATION

3.3.1 General:

.1 Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

.2 Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

.3 Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

.4 Install insulation with longitudinal seams at top and bottom of horizontal runs.

.5 Install multiple layers of insulation with longitudinal and end seams staggered.

.6 Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

.7 Keep insulation materials dry during application and finishing.

.8 Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

.9 Install insulation with least number of joints practical.

.10 Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor barrier mastic.

.1 Install insulation continuously through hangers and around anchor attachments.

.2 For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor barrier mastic.

.3 Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

.4 Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

.11 Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

.12 Install insulation with non-self-sealing factory-applied jackets as follows:

.1 Draw jacket tight and smooth.

.2 Cover circumferential joints with 3 inch (75 mm) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) oc.

.3 Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive longitudinal lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm)

.1 For below ambient services, apply vapor barrier mastic over staples.

.4 Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

.5 Where vapor barriers are indicated, apply vapor barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

.13 Install insulation with self-sealing factory-applied jackets as follows:

.1 Locate all longitudinal pipe insulation jacketing laps in least visible location.

.2 Draw jacket tight and smooth.

.3 For proper sealing, seal lap joints with reasonable pressure being applied with a plastic squeegee or sealing tool.

.4 Vapor seal all circumferential joints with factory furnished matching pressure sensitive butt strips installed with reasonable pressure being applied with a plastic squeegee or sealing tool.

.14 Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

.15 Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

.16 Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

.17 For above ambient services, do not install insulation to the following:

.1 Vibration control devices.

.2 Testing agency labels and stamps.

.3 Nameplates and data plates.

.4 Manholes.

.5 Handholes.

.6 Cleanouts.

3.3.2 Type 1 and 2 Insulation:

.1 Insulation Installation on Straight Pipes and Tubes.

.1 Secure pipe insulation to pipe using self-sealing lap system.

.2 On high temperature piping, above 500 deg F (260 deg C), apply insulation using double layer and staggered joints. For double layer installation, secure the unjacketed inner layer using filament tape; without deforming insulation material. All joints and ends must be firmly butted and secured with appropriate securing material.

.3 Firmly rub all longitudinal and circumferential joints using a squeegee or sealing tool.

.4 Longitudinal jacket laps for pipe insulation installed on piping systems with operating temperatures below ambient shall be vapor sealed with factory-applied pressure-sensitive adhesive vapor retarder, self-sealing lap. For proper sealing, firmly rub lap joints with reasonable pressure being applied with a plastic squeegee or sealing tool. Vapor seal all circumferential joints with factory-furnished, matching pressure-sensitive butt strips installed with reasonable pressure being applied with a plastic squeegee or sealing tool. Additionally, coat raw edges of pipe insulation sections with vapor retarder mastic at 12 foot (3.6 m) to 21 foot (6.4 m) intervals; at Engineer's discretion on straight piping, and on either side of all fittings, flanges, or valves. Vapor retarder mastic shall completely coat the ends of the pipe and extend onto the bore of the pipe insulation and onto the jacketing a minimum of 2 inches (51 mm). Follow NAIMA's "Guide to Insulating Chilled Water Piping Systems with Mineral Fiber Pipe Insulation" for additional details.

.5 Install metal shields between hangers or supports and the pipe insulation. Install rigid insulation inserts as required between the pipe and the insulation shields. Inserts shall be of equal thickness to the adjacent insulation, and shall be vapor sealed as required. Insulation shields shall be no less than the following lengths:

.1 1-1/2 inch (38 mm) to 2-1/2 inch (64 mm) IPS: 10 inch (254 mm) long.

.2 3 inch (76 mm) to 6 inch (152 mm) IPS: 12 inch (305 mm) long.

.3 8 inch (203 mm) to 10 inch (254 mm) IPS: 16 inch (406 mm) long.

.4 12 inch (305 mm) and over IPS: 22 inch (559 mm).

.6 For piping subject to abuse in mechanical rooms or high traffic areas, protect insulation from mechanical abuse by the use of appropriate thickness of PVC jacketing, metal jacketing, or laminated self-adhesive water and weather seal.

.7 Insulation Installation for Pipe Flanges:

.1 Install preformed pipe insulation to outer diameter of pipe flange.

.2 Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

.3 Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with Glass Mineral Wool blanket insulation.

.4 Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

.8 Insulation Installation on Pipe Fittings and Elbows:

.1 Install preformed formaldehyde free Glass Mineral Wool fittings; of same material as straight segments of pipe insulation when available.

.2 When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

.9 Insulation Installation on Valves and Pipe Specialties:

.1 Install preformed formaldehyde free fittings; of same material as straight segments of pipe insulation when available.

.2 When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to valve body.

.3 Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

.4 Install insulation to flanges as specified for flange insulation application.

3.3.3 Type 3 Insulation:

.1 Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unsplit sections over the open ends of piping or tubing. All seams and butt joints shall be adhered and sealed using Armaflex 520 or 520 BLV Adhesive. A thin coat of adhesive must be applied to both surfaces, allowed to tack and join both surfaces with firm pressure.

.2 The insulation must be installed in compression to allow for expansion and contraction. Install an additional 1.5 inches of insulation for every six feet of installed pipe or an additional 2 percent of measured pipe length.

.3 Insulation shall be pushed onto the pipe, never pulled. Stretching of insulation may result in open seams and joints.

.4 Tape the ends of the copper tubing before slipping the Armaflex pipe insulation over the new pipes to prevent dust from entering the pipe.

.5 All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp knives must be used.

.6 On heat traced systems, the tracer shall not exceed the allowable temperature limit of the insulation material. Insulation ID may need to be oversized to accommodate heat trace tape.

.7 Seams shall be staggered when applying multiple layers of insulation.

.8 All outdoor exposed piping shall be painted with two coats of WB Armaflex Finish. Prior to applying the Finish, the insulation shall be wiped clean with denatured alcohol. The Finish shall not be tinted. To ensure good adhesion, the temperature should be above 50 °F during application and drying.

.9 All outdoor exposed piping shall have the seams located on the lower half of the pipe.

.10 As an alternative to WB Armaflex Finish, metal or aluminum jacketing may be used and should be applied according to the manufacturer's recommendations.

3.3.4 Penetrations:

.1 Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

.1 Seal penetrations with flashing sealant.

.2 For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

.3 Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.

.4 Seal jacket to roof flashing with flashing sealant.

.2 Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

.3 Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

.1 Seal penetrations with flashing sealant.

.2 For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

.3 Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).

.4 Seal jacket to wall flashing with flashing sealant.

.4 Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

.5 Insulation Installation at Fire Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire rated walls and partitions.

.1 Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire resistive joint sealers.

.6 Insulation Installation at Floor Penetrations:

.1 Pipe: Install insulation continuously through floor penetrations.

.2 Seal penetrations through fire rated assemblies. Comply with requirements in Section 07 84 13, Penetration Fire-stopping.

3.3.5 Field Applied Jackets:

.1 Where glass cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

.1 Draw jacket smooth and tight to surface with 2 inch (50 mm) overlap at seams and joints.

.2 Embed glass cloth between two 0.062 inch (1.6 mm) thick coats of lagging adhesive.

.3 Completely encapsulate insulation with coating, leaving no exposed insulation.

.2 Where Laminated Self-Adhesive Water and Weather Seals are indicated, install in strict compliance with manufacturer's recommended installation procedures.

3.3.6 Finishes:

.1 Pipe Insulation with ASJ+, ASJ, Glass Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below. NOTE: Painting MAY affect the FHC Classification of the Jacketing material.

.2 Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

.3 Finish Coat Material: Interior, flat, latex emulsion size.

.4 Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

.5 Do not field paint aluminum or stainless-steel jackets.

3.4 PIPING INSULATION SCHEDULES

3.4.1 General

.1 Chilled Water shall be provided with Type 1 insulation for the piping and Type 3 insulation for all valves and devices.

.2 Condenser Water Piping for cooling towers on the exterior of the building shall be insulated. Provide Type 1 insulation on the piping and Type 2 insulation on the valves and devices.

.3 Type 2 insulation may be used for all pipe sizes 10” (300mm) and greater.

Table 2 – Insulation Type & Thickness Schedule

Application	Operating Temperature (F)	Type	Less than 1”	1 TO 1-1/4”	1-1/2” TO 3”	4 TO 6”	8” and Larger

Equipment drain lines, Safety Relief, etc.	Up to 93 C (200° F)	Type 1	1.5" 40mm	1.5" 40mm	2" 50mm	2" 50mm	2" 50mm
Chilled Water	4.4 C to 12.8 C (40° F to 55° F)	Type 1 + Type 3	1" 25mm	1" 25mm	1" 25mm	1.5" 40mm	1.5" 40mm
Condenser Water	4.4 C to 12.8 C (85°F to 100° F)	Type 1 + Type 3	1" 25mm	1" 25mm	1" 25mm	1.5" 40mm	1.5" 40mm
Refrigerant Piping		Type 3	1/2" 12mm	1" 25mm	1" 25mm	1" 25mm	1.5" 40mm

3.5 FINISHES:

3.5.1 Canvas:

.1 Apply in exposed areas on piping with operating temperatures 80 C (180 F) and above.

.2 Compacted firm, ULC listed, heavy plain weave, cotton fabric at 220g/m2 (6 oz. per sq. yd) treated with diluted fire retardant lagging adhesive.

.3 On concealed valves and fittings use ULC listed plain weave cotton fabric at 120 g/m2 (3 oz. per sq. yd)

3.5.2 Aluminum or Stainless Steel

.1 Apply in areas exposed to the outdoors

.2 To CSA HA Series M1980:

.3 Crimped or embossed alloy jacketing 0.045mm (0.016") 26 gauge thick with longitudinal slip joints and 50mm (2") end laps with factory attached protective liner on interior surface. Aluminum alloy butt straps with mechanical fasteners;

.4 Jackets on fitting, 0.045mm (0.016") thick, die shaped components of alloy with factory attached protective liner on interior surface.

3.5.3 PVC:

.1 Apply in exposed areas on piping with operating temperatures less than 80 C (180F).

.2 Piping: ULC listed PVC moulded type jacketing material, gloss white complying with 25 Flame Spread and 50 Smoke Developed ratings.

.3 Fittings: ULC listed PVC, gloss white, 1 piece, pre moulded fittings complying with 25 Flame Spread and 50 Smoke Developed ratings.

.4 PVC Application: strictly in accordance with the requirements of Authorities having jurisdiction.

.5 Ultraviolet resistant.

.6 Fastenings: To manufacturers standard(s).

3.6 CLEANING

3.6.1 Proceed in accordance with Section 01 74 00 – Cleaning.

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

END OF SECTION

1 GENERAL

1.1 SUMMARY

1.1.1 Section Includes.

.1 Materials and installation for steel piping, valves and fittings for hydronic systems in building services piping.

1.1.2 This section of the specification shall be read in conjunction with and shall be governed by the requirements outlined in Section 22 05 01.

1.1.3 For the requirements for flushing and cleaning of new piping refer to Section 23 25 01 of the specification.

1.1.4 For the requirements for hangers and supports refer to Section 23 05 29 of the specification.

1.1.5 All valves must have a valid CRN Number. Statutory declaration must be provided on request.

1.2 RELATED SECTIONS.

1.2.1 Section 01 33 00 - Submittal Procedures.

1.2.2 Section 01 35 29.06- Health and Safety Requirements.

1.2.3 Section 01 74 21 - Construction/Demolition Waste Management.

1.2.4 Section 01 78 00 - Closeout Submittals.

1.2.5 Section 21 05 00 - Common Work Results -Mechanical.

1.2.6 Section 23 07 19 – Piping Insulation.

1.3 REFERENCES

1.3.1 American Society of Mechanical Engineers (ASME).

.1 ASME B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

.2 ASME B16.3, Malleable Iron Threaded Fittings: Classes 150 and 300.

.3 ASME B16.5, Pipe Flanges and Flanged Fittings: NPS through NPS 24 Metric/Inch Standard.

.4 ASME B16.9, Factory-Made Wrought Buttwelding Fittings.

.5 ASME B18.2.1, Square Hex, Heavy Hex and Askew Head Bolts and Hex, Heavy Hex, Hex Flange and Lag Screws (Inch Series).

.6 ASME B18.2.2, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).

.7 ASME B31.1 – latest edition, Power Piping.

1.3.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.

.2 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

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

.4 ASTM B61, Standard Specification for Steam or Valve Bronze Castings.

.5 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.

.6 ASTM E202, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.

1.3.3 American Water Works Association (AWWA).

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

1.3.4 Canadian Standards Association (CSA International).

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

.2 CAN/CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.

.3 CAN/CSA B51 – latest edition, Boiler, Pressure Vessel and Pressure Piping Code

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

.1 MSS-SP-58 – latest edition, Pipe Hangers and Supports – Materials, Design

.2 MSS-SP-67, Butterfly Valves.

.3 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.

.4 MSS-SP-71, Cast Iron Swing Check Valves Flanged and Threaded Ends.

.5 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.

.6 MSS-SP-85, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.3.6 Ontario Regulations

.1 Ontario Regulation 220/01: Boilers and Pressure Vessels

1.4 SUBMITTALS

1.4.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

1.4.2 Closeout Submittals.

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals, and include the following:

.1 Special servicing requirements.

1.5 QUALITY ASSURANCE

1.5.1 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

1.6.1 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 material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

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

1.6.2 In accordance with manufacturer's instructions.

1.6.3 All piping shall be protected from any damage during shipping, handling and storage. All pipe ends shall be covered to prevent accumulation of dirt and debris inside the piping.

1.6.4 Contractor shall be responsible for handling and delivery of all materials. Replace all damaged and/or defective materials at no cost to owner.

1.7 MAINTENANCE

1.7.1 Extra Materials.

.1 Provide following spare parts:

.1 Valve seats: one for every ten valves, each size. Minimum one.

.2 Discs: one for every ten valves, each size. Minimum one.

.3 Stem packing: one for every ten valves, each size. Minimum one.

.4 Valve handles: two of each size.

.5 Gaskets for flanges: one for every ten flanges.

2 PRODUCTS

2.1 PIPE

2.1.1 NPS 2 and Smaller:

.1 Schedule 40, continuous weld or electric resistance welded black carbon steel conforming to ASTM A53, Grade B with threaded ends / plain ends.

.2 Type ”L” hard drawn copper tubing conforming to ASTM B88. Type ”L” soft annealed copper tubing may be used within convector enclosures.

.3 Type ”K” soft annealed copper tubing conforming to ASTM B88 with no joints permitted below the floor for below grade applications. Use approved tube bender for tube bending.

2.1.2 NPS 2-1/2 and Larger:

.1 Schedule 40, continuous weld or electric resistance welded black carbon steel conforming to ASTM A53 Grade B, with bevelled ends.

.2 For all welded connections provide the following:

.1 Prior to Starting work on Site each welder shall provide the following:

.1 Three qualification sample welds for inspection.

.2 These sample welds shall be submitted to the Consultant for review, stored, and identified for validation records.

.3 These welds shall be utilized to certify the welder and machine acceptability.

.2 Visual inspection shall be completed on all Hydronic Piping. Xray/Radiographic testing is only required if the visual inspection of a weld fails based on the requirements in Section 23 05 17.

.3 5% of Hydronic piping shall be visually inspected based on the requirements of Section 23 05 17. If failures occur within the first 5% of visual inspection an additional 10% of the piping shall be visually inspected.

2.2 UNIONS

2.2.1 NPS and Smaller

.1 All brass construction with ground joint and either solder joint or screwed ends as required.

.2 Class 150 black malleable iron construction with brass to iron ground joint and screwed ends, conforming to ASTM A197 and ANSI/ASME B1.20.1.

.3 Provide dielectric unions or couplings at all connections between copper tubing and ferrous piping or equipment.

2.3 FITTINGS

2.3.1 NPS 2 and Smaller:

.1 Wrought copper solder joint pressure type, with IPS to copper adapters at screwed connections. Solder shall be tin antimony 95:5 to ASTM B32

.2 T Drill couplings are acceptable provided that the joints are made with silver brazing alloy conforming to AWS Classification BCuP 5. T drilling shall only be utilized for branch lines where the branch line is 1/2 the size or smaller than the main.

.3 Class 150 black malleable iron screwed fittings conforming to ASTM A197 and ANSI/ASME B16.3

.4 Class 2000 forged steel socket welding type, conforming to ASTM A105 Grade 2 and ANSI/ASME B16.11.

2.3.2 NPS 2-1/2 and Larger:

.1 Schedule 40 seamless carbon steel butt welding fittings conforming to ASTM A234 WPB and ANSI/ASME B16.9.

2.3.3 Provide Canadian Registration Numbers (CRN).

2.4 FLANGES

2.4.1 Class 150 forged steel slip on or weldneck raised face type conforming to ASTM A181 Grade 1 and ANSI/ASME B16.5. Remove raised face where flanges connect to Class 125 cast iron valves.

2.4.2 Hinged, 2 piece, shouldered or keyed cast malleable iron conforming to ASTM A47 Grade 32510 with elastomeric gasket suitable for service and lock bolt.

2.4.3 Provide Canadian Registration Numbers (CRN).

2.5 GASKETS AND BOLTS

2.5.1 Gaskets:

.1 1/16" (1.6 mm) Garlock 3200 with SBR binder or equivalent asbestos free material.

2.5.2 Bolts:

.1 Semi finished hex head machine bolts and semi finished hex nuts, both of carbon steel conforming to ASTM A307 Class A.

2.6 HANGERS AND SUPPORTS

2.6.1 In accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

2.7 PLUGS

2.7.1 NPS 2 and Smaller:

.1 Class 3000 screwed, square head, machined from solid steel or forging to ASTM A105 Grade 2.

2.8 VALVES

2.8.1 General

.1 Provide bronze valves with bodies made of bronze conforming to ASTM B62.

.2 Use gate and globe valves of a design which permits valve to be re packed under pressure when fully open.

.3 Provide valves with manufacturer's name or trade mark, figure number and pressure rating cast or stamped on valve body.

.4 Provide globe, angle and check valves with composition discs with manufacturer's recommended disc for type of service on which it is to be used, unless otherwise specified.

.5 Install balancing valves in piping for balancing purposes where shown on the drawings, details or schematics.

.6 All valves shall have appropriate CRN numbers.

2.8.2 Globe Valves

.1 NPS 2 and Under - Screwed:

.1 To MSS SP 80, Class 150, 1000 kPa, bronze body, screwed over bonnet, renewable composition disc.

.2 Lockable handles.

.3 Standard of Acceptance: Jenkins: 106BJ, Crane, Kitz, Grinnell

.2 NPS 2 1/2 and Over - Flanged:

.1 To MSS SP 85, Class 125, 860 kPa, F.F. flange, cast iron body, bronze trim, OS&Y, bolted bonnet, bronze disc and seat ring.

.2 Standard of Acceptance: Jenkins 2342J, Crane, Kitz, Grinnell

2.8.3 Gate Valves

.1 NPS 2 and Under - Screwed:

.1 Rising Stem: To MSS SP 80, Class 125, 860 kPa, bronze body, solid wedge disc.

.2 Standard of Acceptance: Jenkins 810J, Crane, Kitz, Grinnell.

.2 NPS 2 1/2 and Over - Flanged:

.1 Rising Stem: To MSS SP 70, Class 125, 860 kPa, FF flange, cast iron body, OS&Y bronze trim.

.2 Standard of Acceptance: Jenkins 454J, Crane, Kitz, Grinnell.

3 EXECUTION

3.1 PIPING INSTALLATION

3.1.1 Install pipework in accordance with Section 23 05 05 - Installation of Pipe Work.

3.1.2 Inspect all materials upon delivery and prior to installation, any defective and/or unsatisfactory materials shall be removed from site.

3.1.3 All joints and fittings shall be welded.

3.1.4 All elbows shall be long radius, unless specified otherwise.

3.1.5 Provide expansion compensators (including expansion loops) in the piping where required. Provide pipe alignment guides where required, including double guides at each side of expansion loops and/or compensators, with exact locations as per the expansion compensator supplier's recommendations.

3.1.6 Provide engineered anchors to secure pipework to the structure where required. Anchors shall be in accordance with reviewed shop drawings.

3.1.7 Provide shut-off valves in piping connections to equipment, to isolate piping risers, and to isolate other sections of systems as required for proper operation and maintenance of the systems.

3.1.8 Provide a check valve in the discharge piping of every pump and wherever else required for proper operation and maintenance of systems. Note that check valves for vertical inline circulating pumps are integral with the discharge accessory supplied with the pump.

3.1.9 Provide a drain valve at the base of each piping riser, in drain connections to equipment, in low points of horizontal piping and wherever else required.

3.1.10 Provide circuit balancing valves in piping where required but with exact locations in accordance with instructions of personnel doing system flow balancing work.

3.1.11 Provide factory set pressure relief valves where required. Pipe the discharge of each relief valve to drain unless otherwise specified.

3.1.12 Provide an air vent in piping mains at all high points, at equipment connections, and wherever else required. Equip each air vent with a ball type shut-off valve.

3.1.13 Provide strainers in piping where required. Clean strainer baskets after piping system flushing and cleaning is complete, and before water quantity balancing commences.

3.1.14 Provide expansion tanks where required. Secure each vertical tank stand to a concrete housekeeping pad by means of machine bolts. Support horizontal tanks on steel saddles secured to the structure by means of hanger rods. Extend a drain line from each tank piping and terminate each drain line with a drain valve. Provide a water make-up connection line complete with relief valve pressure gauge for each tank. Terminate the make-up piping for connection to potable cold water piping.

3.1.15 Provide hot water reheat coils for ductwork systems where required. Secure each coil in place from the structure by means of hanger rods, independent of connecting ductwork but ready for duct connections.

3.1.16 Connect glycol mixing panel to BAS system.

3.1.17 Underground pre-insulated piping shall be installed as per manufacture instructions.

3.1.18 Contractor shall obtain the services of the manufacture representative of Underground pre-insulated piping to review and certify installation as required.

3.1.19 All piping fittings requiring access (valves, check valves, balancing valves, strainers, control valves, flow meters, etc) shall be installed with sufficient access for operation, servicing, cleaning, replacement and removal.

3.1.20 All piping shall be independently supported.

3.2 CLEANING, FLUSHING AND START-UP

3.2.1 In accordance with Section 23 08 16 - Cleaning and Start-Up of Mechanical Piping Systems

3.3 PERFORMANCE VERIFICATION

3.3.1 In accordance with Section 23 08 13 - Performance Verification of Mechanical Piping

END OF SECTION

1 GENERAL

1.1 GENERAL

1.1.1 This Section covers items common to Sections of Division 26. This section supplements requirements of Division 1, Division 23, Division 27, Division 28, Division 33 and Division 34. Refer to Section 01 00 00 – Bid Depository Sections where applicable for bid depository.

1.2 REFERENCES

1.2.1 Canadian Standards Association (CSA)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

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

1.3 SUBMITTALS

1.3.1 Submit drawings stamped and signed by professional engineer.

1.4 PERMITS, FEES AND INSPECTION

1.4.1 Submit to Electrical Inspection Division and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

1.4.2 Pay associated fees.

1.4.3 Owner’s Representative will provide drawings and specifications required by Electrical Inspection Division and Supply Authority at no cost.

1.4.4 Notify Owner’s Representative of changes required by Electrical Inspection Division prior to making changes.

1.4.5 Furnish Certificates of Acceptance from Electrical Inspection Division or authorities having jurisdiction on completion of work to Owner’s Representative.

1.5 CO-ORDINATION

1.5.1 Co-ordinate work with work of other divisions to avoid conflict.

1.5.2 Locate distribution systems, equipment, and materials to provide minimum interference and maximum usable space.

1.5.3 Locate all existing underground services and make all parties aware of their existence and location.

1.5.4 Where interference occurs, Owner’s Representative must approve relocation of equipment and materials regardless of installation order.

1.5.5 Notwithstanding the review of shop drawings, this division may be required to relocate electrical equipment which interferes with the equipment of other trades, due to lack of co-ordination by this Division. The cost of this relocation shall be the responsibility of this Division. The Owner's Representative shall decide the extent of relocation required.

1.6 PROTECTION

1.6.1 Protect exposed live equipment during construction for personnel safety.

1.6.2 Shield and mark all live parts "LIVE 120 VOLTS", or with appropriate voltage in English.

1.7 RECORD DRAWINGS

1.7.1 Obtain and pay for three sets of white prints. As the job progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times and present for scrutiny at each job meeting.

1.7.2 Show on the record drawings the installed inverts of all services entering and leaving the building and the property. Dimension underground services at key points of every run in relation to the structure and building.

1.7.3 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.

1.7.4 Submit record drawings within 30 days prior to start of commissioning.

1.7.5 On completion of the project, electrical contractor shall request Electrical AutoCAD drawing for preparation of AS built drawings. Transfer all red-line mark up onto AutoCAD drawing to reflect AS built condition. Submit the electronic copy to engineer for review and approval.

.1 Final As Built drawing shall include following information:

.1 All revisions during construction.

.2 All Emergency feeders route and exterior underground feeders routes.

1.7.6 If required, Engineer's Representative can produce the final AS built drawing in CAD at electrical contractor's expense of $200.00 per sheet. Contractor shall provide red-line mark up drawing to Engineer's representative for preparation.

1.8 SHOP DRAWING SUBMITTAL

1.8.1 Shop drawing shall indicate the materials and/or equipment being supplied, all details of construction, accurate dimensions, capacity, operating characteristic and performance.

1.8.2 Submit shop drawing electronically, by email, in PDF format. Scanned PDF is not acceptable.

1.8.3 All shop drawings shall include the contractor's stamps and signed by contractor to indicate all shop drawings have been reviewed by the contractor and all requirement per contract documents have been reviewed and in conformance prior to submission to electrical consultant for review.

1.8.4 Equipment shall not be released to manufacture for purchasing until shop drawing has been reviewed by electrical consultant. Otherwise, Contractor shall assume responsibility and cost incur for the purchase equipment resulting design change/installation change.

1.9 INSPECTION OF WORK

1.9.1 The Owner will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications but will not execute quality control. The Contractor shall be responsible for the execution of his work in conformity with the construction documents and with the requirements of the inspection authority.

1.10 SCHEDULING OF WORK

1.10.1 Work shall be scheduled in phases as per other divisions of the architectural specifications.

1.10.2 Become familiar with the phasing requirements for the work and comply with these conditions.

1.10.3 No additional monies will be paid for contractor's requirement to comply with work phasing conditions.

1.11 VALUATION OF CHANGES

1.11.1 Contractor shall provide the Engineer's Representative with a detailed cost analysis of the contemplated change indicating:

.1 Quantity of each material.

.2 Unit cost of each material.

.3 Time involved.

.4 Sub-trade quotations including a complete analysis of costs.

.5 Mark-ups, if applicable.

.6 Value of GST or HST, as applicable.

.7 Proposed change in Contract Time.

1.11.2 The detailed cost breakdown is to list material and labour separately for each item on the proposed change.

1.11.3 The following shall not be included in the cost of the work but are covered by the allowance (mark-ups) for overhead and profit:

.1 The Contractor's payroll, administrative, head office and site office expenses, including stationary, postage and other office supplies.

.2 The costs of the Contractor's Project Manager, clerical and administrative personnel, and executive personnel.

.3 Use of temporary offices, sheds, small/hand tools, storage, and site office consumables, etc., including but not limited to the cost of telephone, light, power, water and heat used therein.

.4 Transportation and overnight room expenses for out of town labour, if local labour is unavailable.

.5 Insurance premiums, all government payroll burdens, variable labour factors and union or association funds.

.6 Licenses and permits, except when these are special for a particular item of work.

.7 Printing charges for Proposed Changes, Change Orders and Drawings for Contractor's and Subcontractors' use in the work. Engineer's Representative will provide a PDF electronic copy of change notice documentation.

.8 The cost of preparing record, layout and working drawings and shop drawings.

.9 The cost of clean-up and disposal of waste material.

.10 Parking, travel, coffee break/rest periods, warranties, safety training, WHMIS and health and safety committee, and non-productivity time.

.11 Rentals, additional bonding, project financing.

.12 Product receiving and transportation.

1.11.4 The Contractor may apply markups for overhead and profit to approved changes as follows:

.1 10% for work carried out by the Contractor's own forces; and

.2 7% for work carried out by Subcontractors.

1.11.5 Similarly, Subcontractors may apply markups for overhead and profit as follows:

.1 10% for work carried out by their own forces; and

.2 7% for work carried out by subcontractors.

1.11.6 During the duration of the electrical contract, extra work hourly labour units are to be based on the latest edition of the National Electrical Contractors Association (NECA) labour units column 1(one). No additional factors will be accepted.

2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment, which is not CSA certified, obtain special approval from Electrical Inspection Division.

2.2 WARNING SIGNS

2.2.1 As specified and to meet requirements of Electrical Inspection and Owner's Representative.

2.2.2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

2.3 CONDUIT AND CABLE IDENTIFICATION

2.3.1 Colour code conduits, boxes and metallic sheathed cables.

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

2.4 EQUIPMENT IDENTIFICAITON

2.4.1 Identify electrical equipment with lamacoid labelled nameplates.

.1 Name plate shall be black with minimum 19mm high white engraved letter.

.2 Name plate shall be provided for all electrical equipment, but not limited to following:

.1 Electrical distribution equipment, such as switchboard, distribution panel, splitter, disconnect switch, branch panels, receptacle, etc.

.2 Dry type transformers

.3 Control devices, such as starter, contactors, etc.

.4 Mechanical equipment

.5 Generator & automatic transfer switch.

.3 Nameplate for switchboard, electrical distribution equipment shall indicate the name of the equipment, rated ampacity, voltage, phase, number of wires and source of power.

.4 Name plate for Automatic Transfer switch - ATS shall indicate ampacity, voltage, transfer switch arrangement, kA rating, upstream source of normal power and Emergency power.

.5 Name plate for control devices shall indicate the equipment that's controlling

.6 Name plate for transformer shall indicate primary and secondary voltage and the source of the power.

.7 Name plate for disconnect switch/breaker within switchboard/distribution panel shall indicate the label of equipment that is protecting.

.8 Mechanical equipment: indicate equipment name and full circuit number including panel board identification

.9 All receptacles are to be labelled with the respective circuit numbers with a printed label, similar to a Brady label, with 12mm characters. Circuit number to include full circuit number including panel board identification.

.10 Generators:

.1 Indicate kW rating, kVA rating, voltage, number of phases, number of wires, generator neutral grounding arrangement, year and month manufactured, and engine and alternator serial number.

2.4.2 The interior and lids of all junction boxes and outlets boxes shall be neatly identified with different colours of paint. The colours shall be consistent throughout the project for the following system:

.1	347/600 Volt System	Black
.2	120/208 Volt System	Blue
.3	347/600 Volt System	Green
.4	120/208 Volt Emergency System	Orange
.5	Fire Alarm System	Red
.6	Security system	Grey

2.5 PLYWOOD BACKBOARDS

.1 Provide fire rated plywood backboards for all surfaced mounted panel on the drawing. Plywood to be 21mm, UF free and shall be FSC/SFI/CSA Z809 certified. Plywood shall be fire rated/coated with fire retardance paint.

2.6 HOUSEKEEPING PADS

.1 Provide concrete housekeeping pads under all floor mounted electrical equipment and as indicated on the drawing. Housekeeping pads shall be minimum 100mm high above finish floor and 78mm beyond electrical equipment.

3 EXECUTION

3.1 NAMEPLATES AND LABELS

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

3.1.2 Provide typed print panel directory for all panels at the end of construction.

3.2 CONDUIT AND CABLE INSTALLATION

3.2.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

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

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

3.2.4 Trips, relays and fuses are installed to required values and settings.

3.3 MEGGERING AND BALANCING

3.3.1 Megger all power circuit feeders. If ground resistance on any circuit is less than that required by CSA or other governing regulations, such circuits are to be considered defective and must be replaced.

3.3.2 Measure phase current to panelboards with normal loads operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and submit a report for insertion into manuals.

3.4 FIELD QUALITY CONTROL

3.4.1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentice's program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks – the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

3.4.2 The work of this division to be carried out by a contractor who holds a valid Code 1 Electrical Contractor License as issued by the Province.

3.4.3 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

3.5 CLEANING

3.5.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

3.5.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION